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MODERN PLASTICS

APRIL 1946

A NEW ITEM...

An Old Story

For more than twenty-five years, new and unusual electrical appliances of all types—molded in whole or in part of Durez phenolic plastics—have been successfully marketed to the consumer. One of the latest items to come within this category is the "Heet-It" illustrated. This new appliance was designed primarily for heating baby food in the nursery—to save busy mothers many daily trips to distant kitchens. Other applications such as a bedside coffee and broth cooker are obvious.

Why Plastics?

Notice the attractive Durez plastic case and cover. The manufacturer of "Heet-It", Electrical Reactance Corporation, experimented and found that plastics were better suited for these jobs than any other material. Again it's a matter of history repeating itself. Year after year manufacturers in the electrical appliance field have been selecting plastics for specific jobs of this type.

Why Phenolic Plastics?

Because the phenolics are the most versatile of all plastics, alert design-engineers have learned to make them their starting point in solving a materials problem. In this case, the properties called for were dielectric strength, heat resistance, impact strength, attractive finish, and resistance to the acids found in foods. All of these, and more, are inherent characteristics of phenolic plastics.

Why Durez Phenolic Plastics?

For the past quarter century, Durez production has been devoted exclusively to phenolic plastics and resins. As a result, there are now more than 300 multi-propertied Durez phenolic molding compounds from which to select the plastic that precisely fits your job. Furthermore, Durez technicians have gained a wealth of experience through active participation in the successful develpoment of many and varied products for manufactureers in practically every field of industry. Naturally, the benefits which this rich background can bring about are very valuable—and they are yours for the asking.

Write for Free Booklet

"Machining Data on Phenolic Plastics" is an informative manual covering all the standard phenolic plastic machining operations encountered in the average plant. Send for your free copy. No obligation, of course. Durez Plastics & Chemicals, Inc., 54 Walck Road, North Tonawanda, New York. *Export Agents Omni Products Corporation. 40 East 34th St. New York, N. Y.*

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
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PLASTICS THAT FIT THE JOB

Enhanced by *Catalin*, Milady Welcomes the Return of the FULLER BRISTLECOMB

The Fuller Brush Man, an accepted caller in millions of American households, now returns to home service with a refilled portfolio of exquisite new brushes . . . Among his many offerings, the Fuller Bristlecomb for Ladies — pictured above — enhanced both *beauty wise* and *utility wise* by Catalin, the gem of plastics.

The selected, softly mellow, ivory Catalin is a mark of professional good judgment. It accentuates the lithe, straight, structurally-strong back . . . clearly and cleanly emphasizes the unique angled set of the bristles . . . and highlights the gracefully rolled handle grip.

Equally glowing references might also be made to the new matching Fuller Bristlecomb for Men, Fuller Hair and Hand Brushes . . . for each type makes generous use of Catalin's incomparable decorative and functional values.

Catalin casting techniques are now so highly advanced as to encourage product designers to plan intricate custom shapes without recourse to expensive and time-delaying molds. For many applications, the speedy fabrication of standard Catalin shapes gives the manufacturer an even quicker avenue of entry. Members of Catalin's staff will be glad to offer suggestions. Inquiries invited.

CATALIN CORPORATION
ONE PARK AVENUE, NEW YORK 16, N. Y.

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THE GEM OF PLASTICS
Catalin

CAST RESINS • LIQUID RESINS • MOLDING COMPOUNDS

MODERN PLASTICS*

AND PLASTICS*

VOLUME 23 APRIL 1946 NUMBER 8

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* Reg. U. S. Patent Office.

Now it's fly swatters made from Geon ...

. . . What will they think of next?

AN enterprising mid-Westerner had heard about GEON raw materials and the many things that could be made from them. So, he asked himself, why not fly swatters? Products made from GEON, he knew, resist oils and chemicals, sunlight, aging, repeated impact, abrasion, and many other normally destructive factors. They keep their shape indefinitely. They can be brilliantly or delicately colored. They can be waterproof and, so, easily washed. And GEON can be compression molded or injection molded, extruded, calendered or cast into sheet and film.

Samples were made and tested. The initial order was for 300,000 swatters, called Odor-Swat, the King of Swats, made from GEON. These swatters are going to make a good many impressions—on unsuspecting flies—this summer and for years to come.

It may seem a far cry from fly swatters to delicate film for the packaging field—or from dainty make-up capes to linings for acid tanks—from car upholstery material to insulation for wire and cable. But that's the way GEON is; versatile, easy to process, with applications—established and potential—*in literally every field.*

For more information about GEON raw materials and what can be done with them please write Department I-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario.

Geon
Polyvinyl Materials

Here are a few applications for GEON suggested by the unusual properties of the fly swatter

Textile coatings for rainwear, awnings, industrial aprons.
Calendered, embossed sheet for upholstery and luggage.
Calendered or molded sheet for flooring, shoe soles, shower mats.
Paper coatings or film for packaging, wall covering.
Extruded wire and cable insulation.

Photo courtesy The Odor-Swat Co., Brecksville, Ohio

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Case Histories from the **RICHARDSON** *files*

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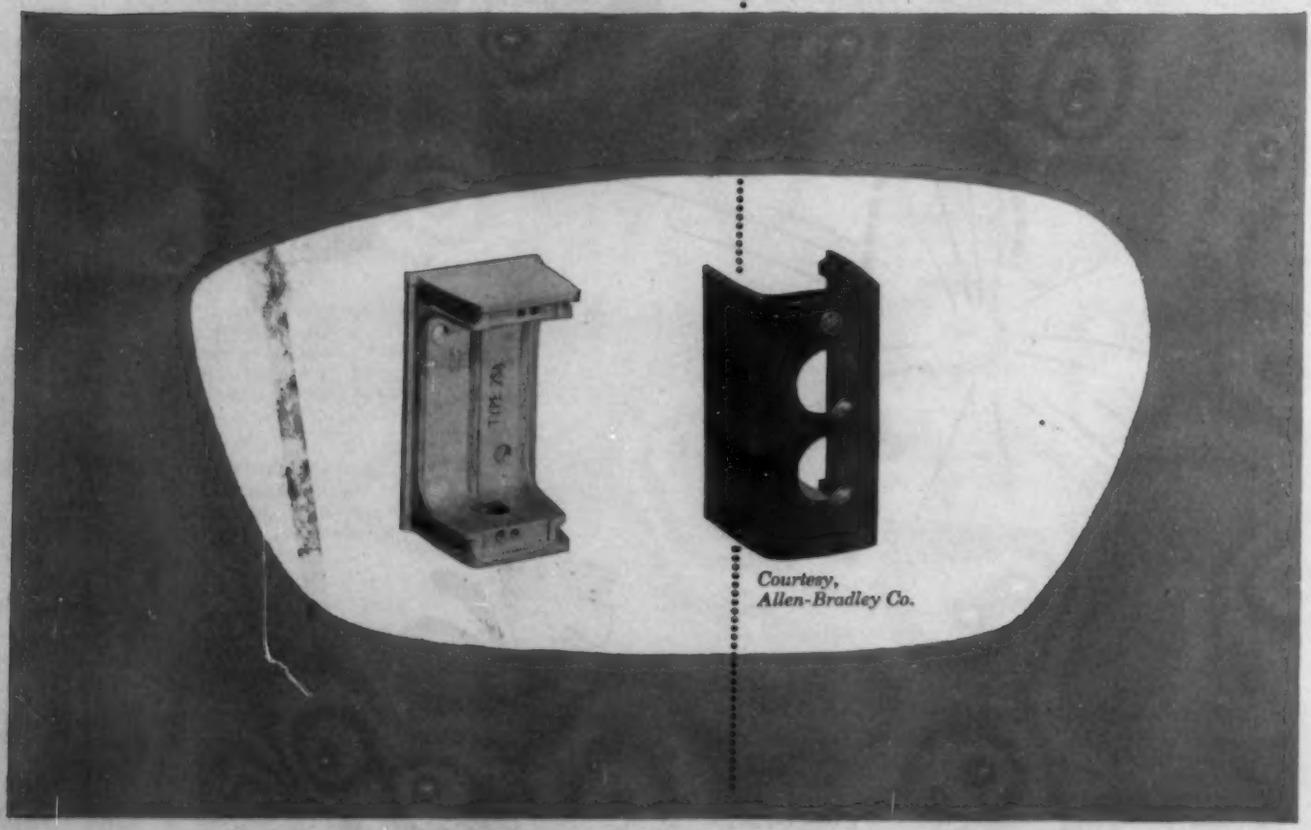

Courtesy, Allen-Bradley Co.

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Plastic Houses

A reporter from MODERN PLASTICS visited Washington, D. C., in an effort to find out what was meant by the vague statement that thousands of plastic houses were to be constructed under the new housing program. The reporter was prepared to jeer, but came back to ponder.

There is undoubtedly a great amount of loose talk in circulation. But, as usual, it comes largely from the uninformed glamour group who would pour a plastic house out of a ladle.

Fortunately, there are some informed technicians in the government, as well as advisers in the periphery surrounding government, who are conscious of the limitations as well as the possibilities of plastics. These persons do not expect the plastics industry to suddenly burst forth with thousands of tailor-made houses that can be set up instantly wherever a plot of ground is available. They are *not* expecting the plastics industry to provide a huge percentage of the houses to be built in 1946.

They want to know: "What *can* the industry provide that will be desirable for exterior and interior use in all types of houses?" and they would like to have some sort of test to show what is actually demanded of structural parts—previous tests have all been based on what a material will do rather than the strength, stress, strain, etc., properties that are required.

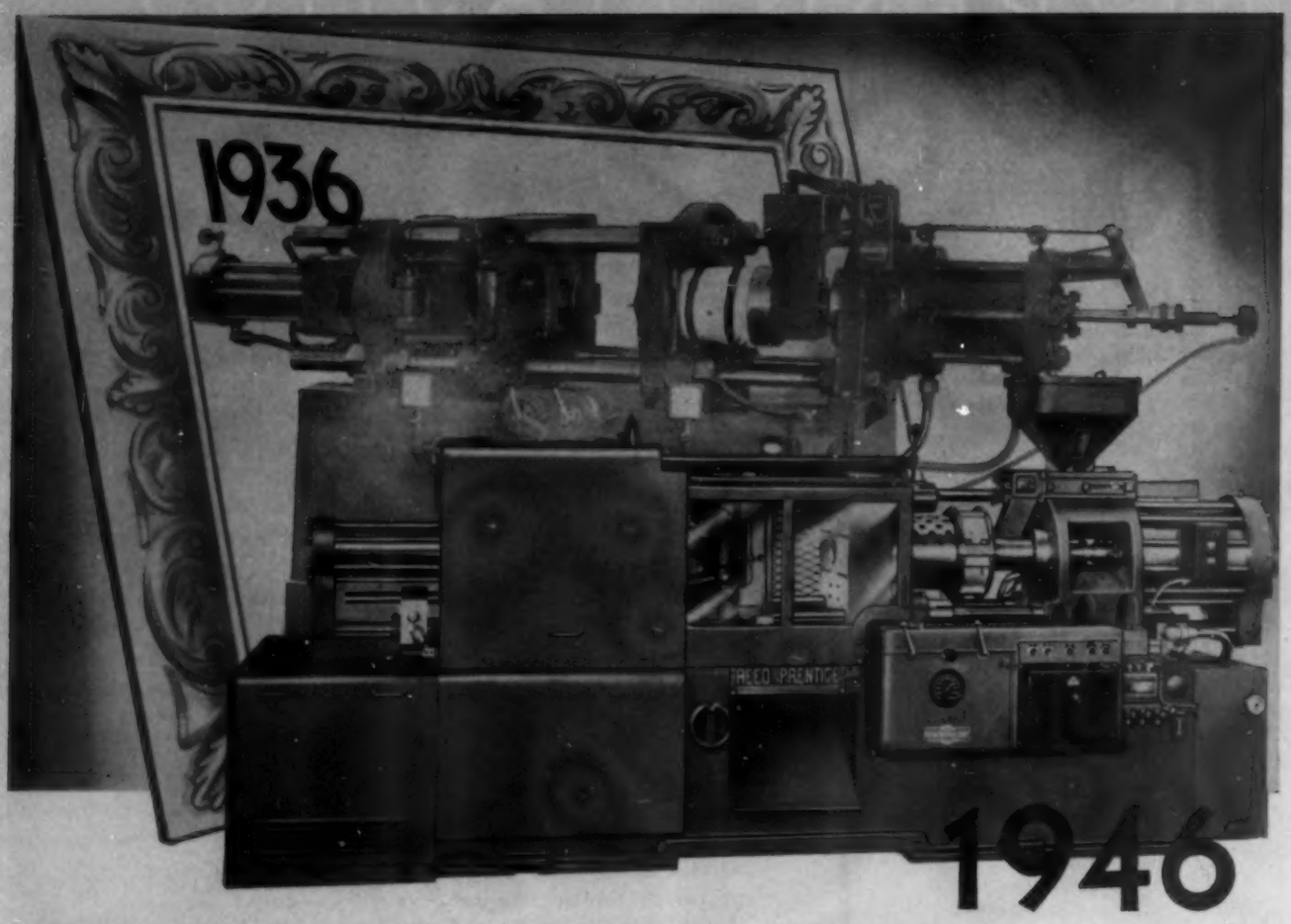
Their closets are full of samples submitted as possible structural materials. It would be impossible to name them all here. Prominent in their exhibits are sandwich and honeycomb materials with outer surfaces of almost every possible type including metals, imitation stone and laminates. Surfaced plywoods form another group of exhibits. Officials point to low-pressure laminated panels as a possibility, at least for interior construction. There is also evidence that some of the less-used resins may find application when mixed with other construction materials as they did during the war emergency.

None of these and other unmentioned items are positive, surefire hits. As some of the leaders of the plastics industry are frank to explain, synthetic resins have not yet proved themselves for exterior use. For airplanes, boats, etc.—yes. But a house with an expected 20-year life span is something quite different.

Caution is necessary to prevent a boomerang that would hurt the entire industry. But, on the other hand, it is possible that the plastics industry is on the threshold of a market that will take it from a poundage to a tonnage basis.

The government wants 2,700,000 houses in 1946 and 1947. There is a permanent market of hundreds of thousands of homes annually after that. Leave out exterior construction if you wish. Interior structural and furnishing materials containing plastics will be needed in unbelievable quantities.

The big push will not come next week or next month. The housing emergency itself, which diverts material to houses rather than factories, will interfere with acquisition of facilities needed to produce plastic materials. And the plastics industry is not yet ready to produce on a scale comparable to its competitors. But, the market for houses can be the stimulator that puts plastics in the top brackets.



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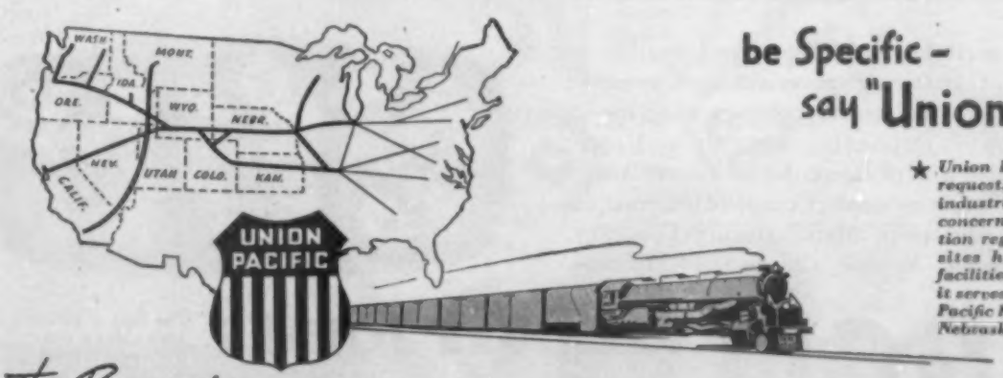

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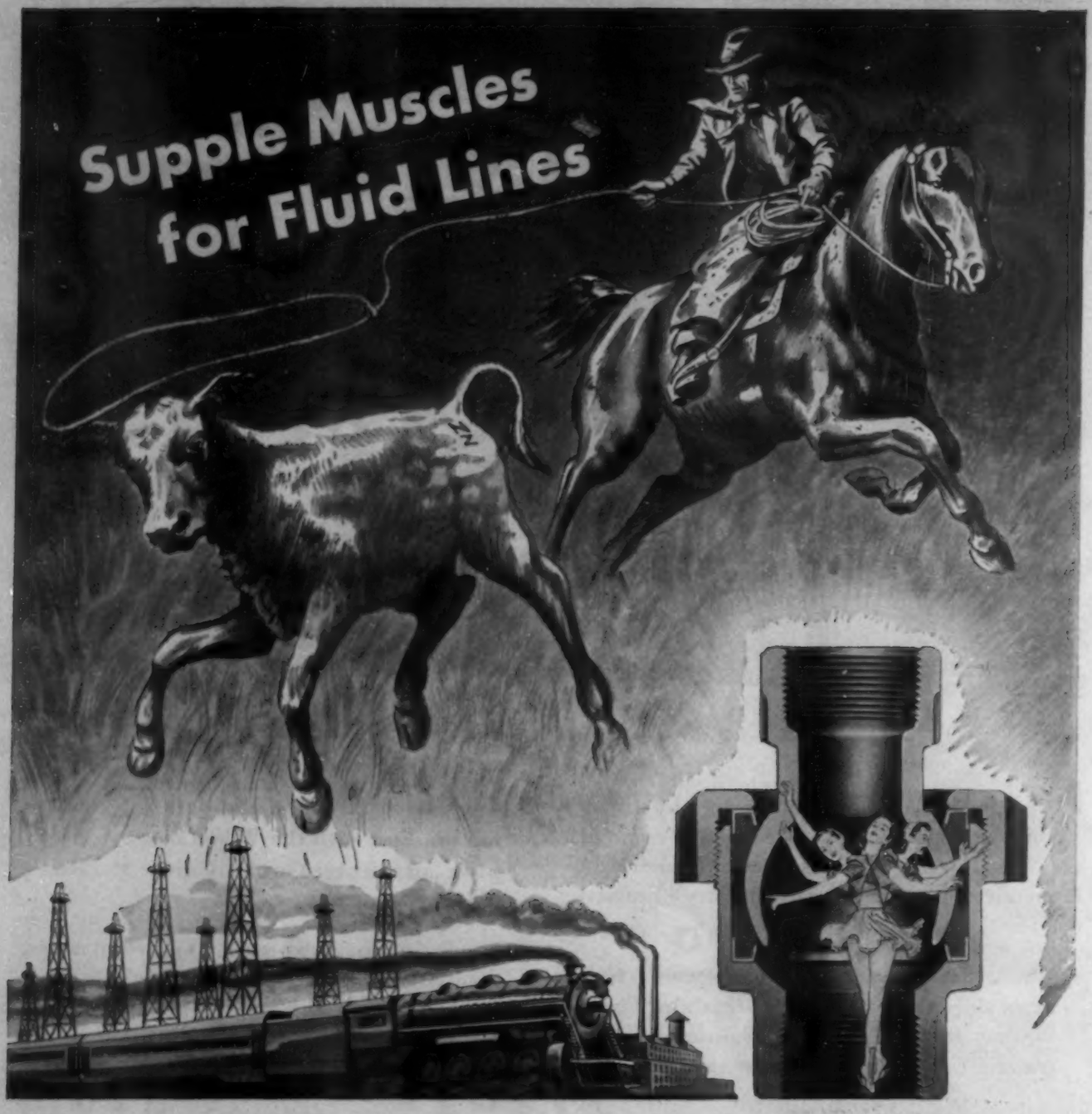

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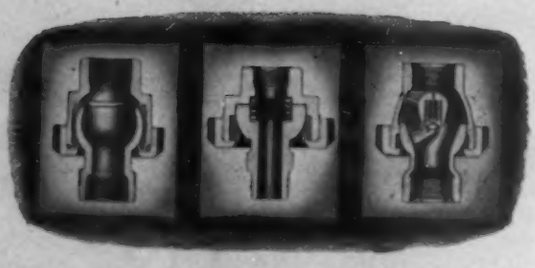

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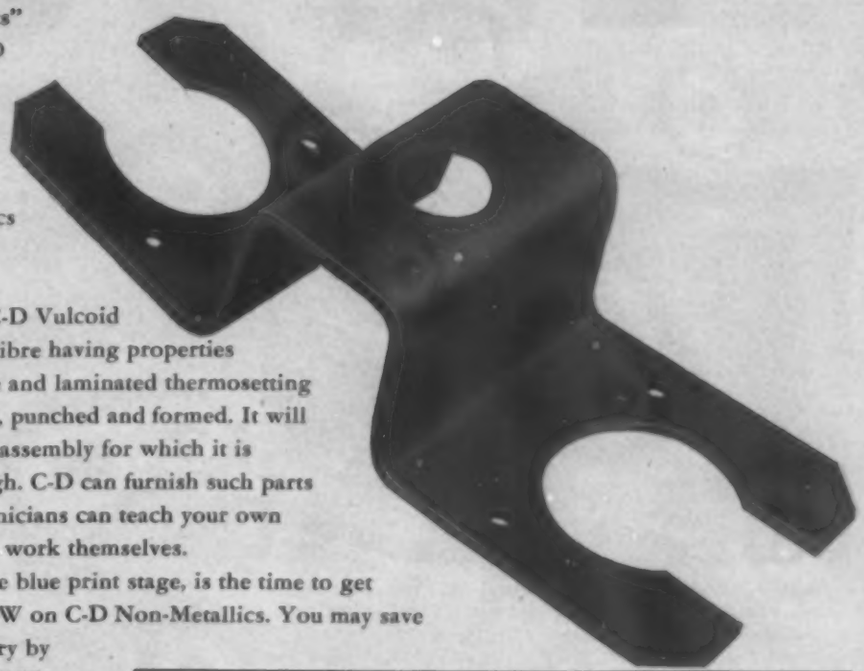

The part illustrated is made from C-D Vulcoid . . . a resin impregnated Vulcanized Fibre having properties intermediate between vulcanized fibre and laminated thermosetting plastics. This part was sawed, drilled, punched and formed. It will hold its shape and readily fit into the assembly for which it is designed. It has resilience and is tough. C-D can furnish such parts fabricated to blue print, or C-D Technicians can teach your own shop men the technique of doing this work themselves.

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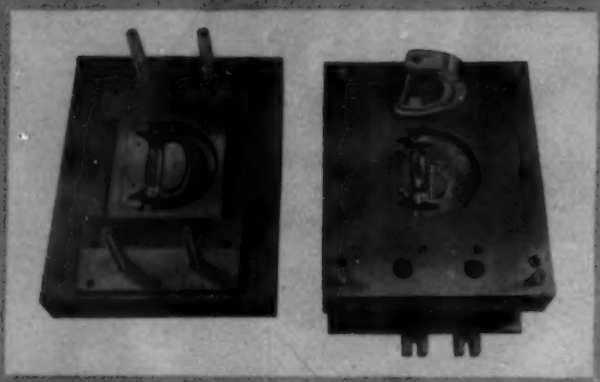
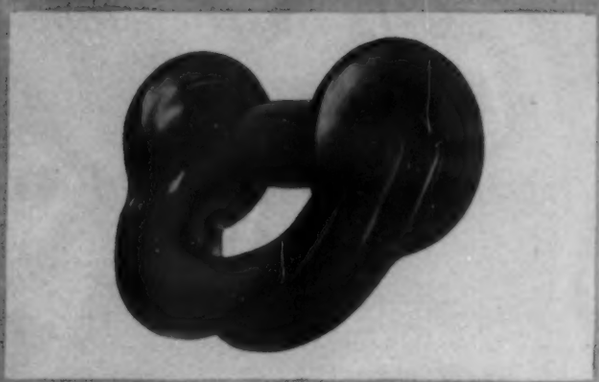
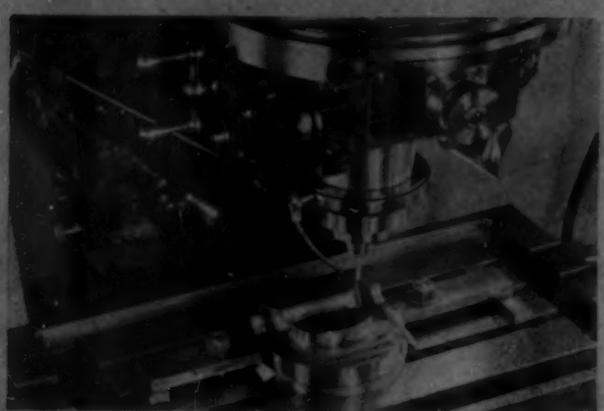


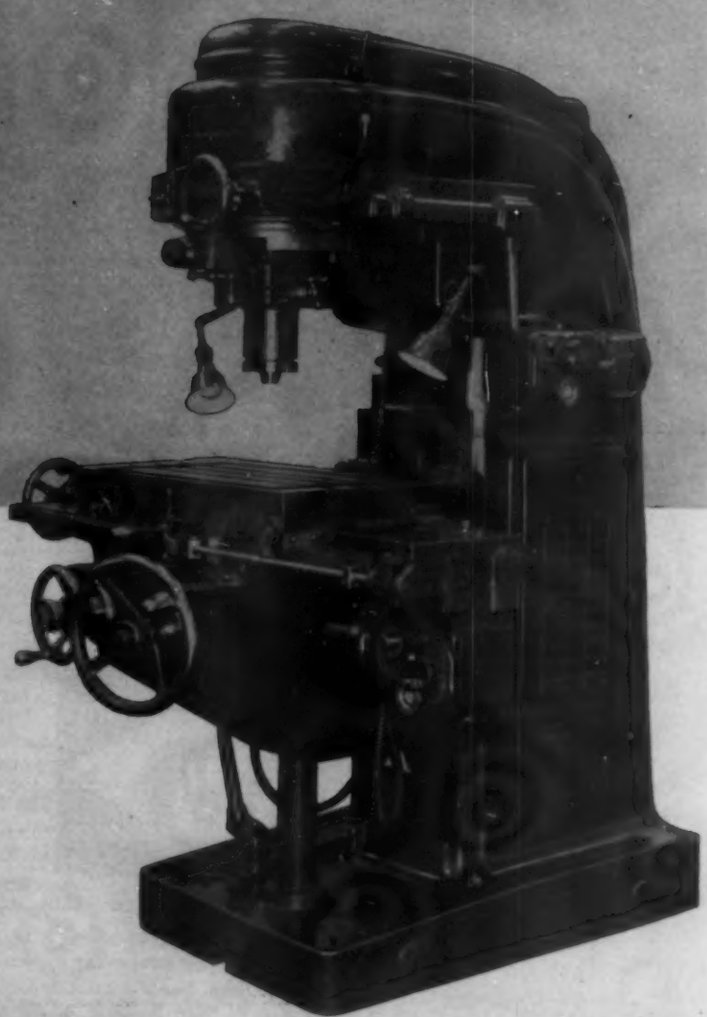
This switch handle transfer mold, using SAE 3012 steel, was made from blueprint dimensions without model or templet.

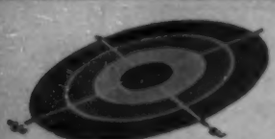


Plastic switch handle as produced by the Kline Manufacturing Co., Galena, Ohio from mold illustrated opposite.



Making complete mold on a K & T Rotary Head Milling Machine assured exact production to drawing specifications — reduced total production costs.





TOTAL TIME for complete mold was 35 hours, employing an inexperienced operator. Little hand-finishing was required. With more operating experience, time could be reduced by milling both halves of the mold in one setup. This is just one example of the outstanding performance a Kearney & Trecker Rotary Head Milling Machine can give you in toolroom, experimental and manufacturing work. SAVES TIME — it mills intricate shapes in a single setup, transmits blueprint dimensions direct to the workpiece without aid of models or templets. AVOIDS ERRORS — it gives you exact control of all mechanical movements. SAVES MONEY — initial preparation and multiple setups are eliminated. Production goes up — costs go down. For further information, write for Bulletin 1002C today!

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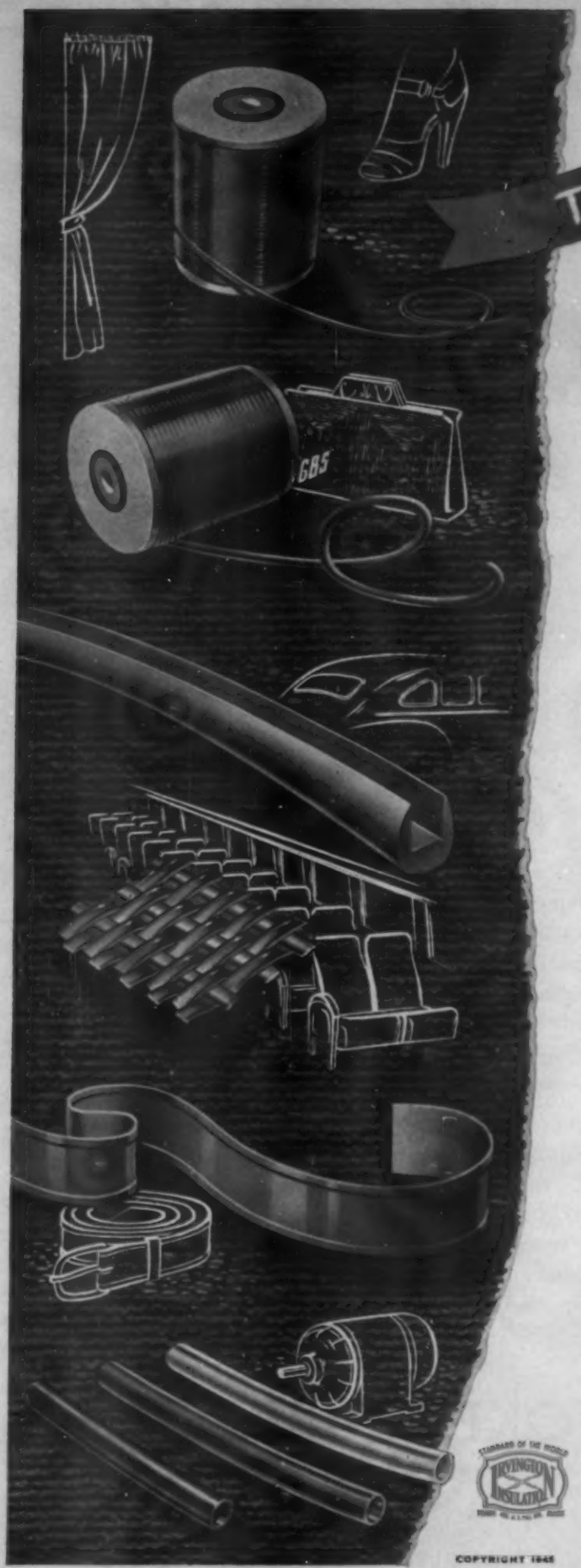

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18 S 97

JOS. STOKES RUBBER CO.

A leading molder of Hard Rubber and Plastics since 1897

TRENTON, N. J.

In Canada: Jos. **STOKES RUBBER** Co., Ltd., WELLAND, ONT.

IS IT BEGINNING TO SHAPE UP?.....

No Matter What You Have In Mind . . . . .
We can Produce Your INDUSTRIAL PARTS and PRODUCTS BY

Injection Molding

From lightweight, sturdy parts that must stand up under severe shock and strain, to small, delicate and intricate parts, FELSENTHAL has what it takes—the very latest of volume-production equipment, backed by men with years of specialized experience in thermoplastics. Just bring us your problem—and we will deliver the product.

OR LAMINATING . . . If the job calls for lamination, look to us for that, too—because we are specialists in the lamination of Vinylite, in any thickness from .005 on up, in Matte or Glossy surface, and in any color or combination of colors.

OR FABRICATING . . . And whether your particular parts are to be printed, screened, or engraved in regular or fluorescent inks, and whether they are to be flat or formed or machined to any shape, we have the equipment and the ability to produce them for you.

REMEMBER, TOO . . . We are set up to handle the complete assembly of your job. We have the facilities, manpower, and experience—and are organized for volume production.

Send for our new catalog. It shows hundreds of products in plastics. Ask for No. 3-A.

WE HAVE THE MEN, MACHINERY, SKILL AND EXPERIENCE TO CARRY THE JOB FROM BLUEPRINT TO PRODUCT IN PLASTICS

FELSENTHAL PLASTICS

G. FELSENTHAL & SONS

4120 W. GRAND AVE. CHICAGO 51, ILL.

Manufacturers Since 1899

BRANCH OFFICES: NEW YORK · DETROIT

7 Major Improvements

• The new Lesters have been designed to produce better injection moldings faster, simpler, more profitably. The new designs have been worked out in full cooperation with the largest injection molders in the United States to give more moldings faster.

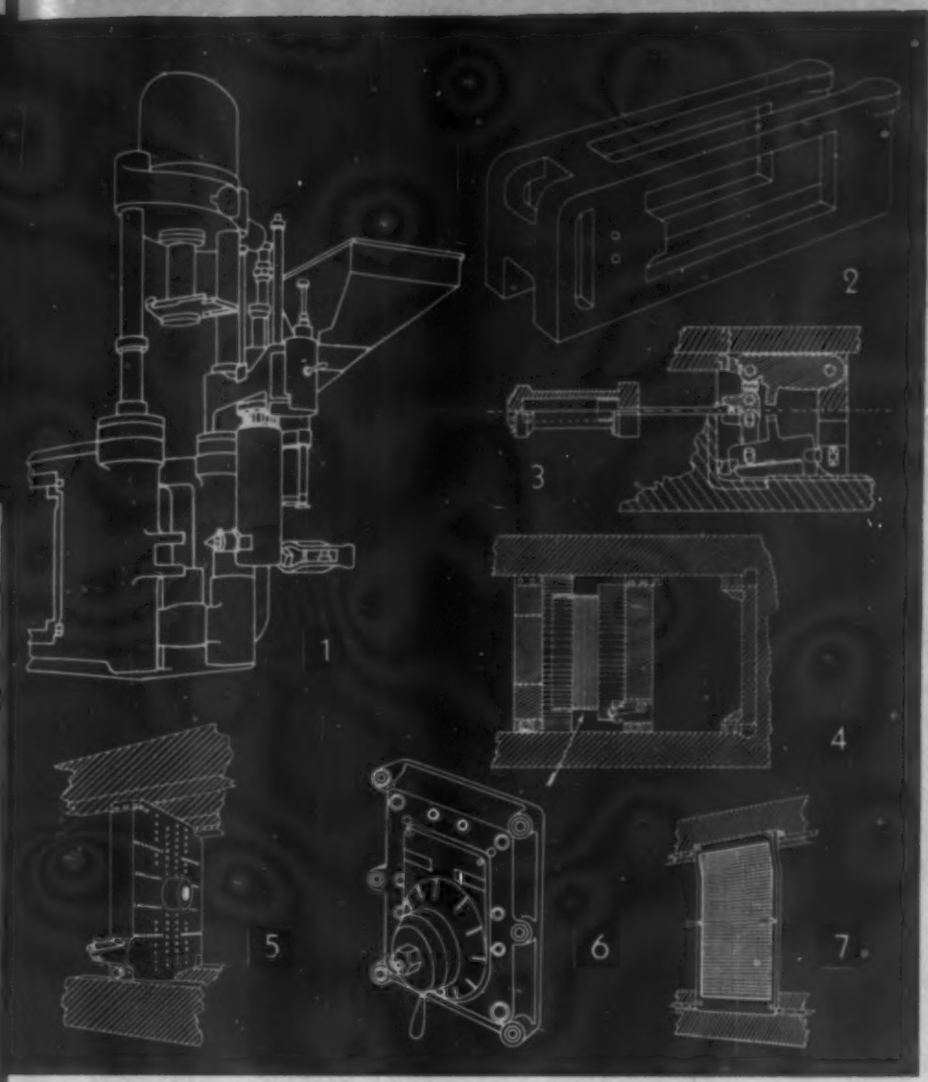
Carefully compiled production and maintenance records not only prove Lesters faster and more efficient on both large and small molding jobs, but show them to be more reliable in standing up under grueling 24-hour-a-day production, *with down time due to repairs often less than 1 percent of total production time.* If you are considering the purchase of new injection molding equipment, investigate the Lester line before you buy.

LESTER MACHINES ARE MADE IN SEVEN CAPACITIES:

SPECIFICATIONS	4-ounce	6-ounce	8-ounce	12-ounce	16-ounce	24-ounce	32-ounce
Molding Area—Sq. In.	60	60	100	100	150	150	150
Pressure P.S.I. on End of Plunger	20,000	20,000	20,000	20,000	27,000	27,000	27,000
Mold Locking Pressure—Tons	225	225	350	350	600	600	600
Cross Section Area Cast Steel Frame—Sq. In.	55	55	110	110	240	240	240
As compared with 4-bar frame Diameter, Each Bar, In.	4	4	6	6	8	8	8
Size of Mold Platens—In.	21x22	21x22	22x28	22x28	29x40 29x34	29x40 29x34	29x40 29x34
Mold Opens—In.	8	8	12	12	16	16	16
Maximum Mold Space Between Platens—In.	15	15	16	16	30	30	30

Write Today

FOR FULL DETAILS AND SPECIFICATIONS



1 THE IMPROVEMENT: New vertical injection cylinder, with solid plunger and internally-heated torpedo; plasticizes material faster, more effectively by means of three external resistance-type heaters and the one internal heater, each with its own temperature control instrument. Plasticizing capacity is greatly increased without burning. Simple resistance-type units heat up quickly during operation and cool off rapidly when operation ceases. Cylinder is accurately and completely filled at each shot (possible only with a vertical cylinder) by the new cylindrical compensating feeder. Entire injection unit can be swung out for easy inspection, cleaning, or replacement. Torpedo is readily removed by means of jack screws.

RESULT: More rapid plasticization, faster cycling, users report *20 to 30 percent* higher production. More efficient and complete plasticization means more fluid pressure in the mold, therefore stronger, denser moldings with finer surface finish.

2 THE IMPROVEMENT: One-piece, cast steel, box-type frame, exclusive with Lester, offers up to 600 tons mold locking pressure to hold the tremendous injection pressure of the new cylinder. The cross sectional area of the frame as compared with the usual bar type frame machines, is indicated in the table at the left. Platens are unobstructed by bars, there is plenty of room for molds to be lowered through top of frame, for unusually long molds and for core pulling devices.

RESULT: Perfect, flash free moldings result from the new frame's fixed parallelism and resistance to increased fluid pressure in the mold cavities. Eliminating of fitted joints means greater rigidity and strength, less wear and tear and maintenance cost on the entire machine.

3 THE IMPROVEMENT: Greater mold opening and movement is now provided. Toggle links have hardened rotary cam locks, providing four solid metal-to-metal columns support to the closed mold, locking it against the injection pressure.

RESULT: Greater travel of platen permits use of larger, deeper molds, while actual opening can be limited to the minimum required for each job; molding cycle is speeded up.

4 THE IMPROVEMENT: Diameter of the Lester central die height adjusting screw has been increased. Adjustment is still by a *single hand crank.*

RESULT: Increased screw diameter eliminates possibility of platen deflection.

5 THE IMPROVEMENT: Automatic hydraulic ejection after mold is fully open, is provided in 16, 24 and 32-ounce machines; optional on others. Action is easy and gentle.

RESULT: Ejector allows for deeper moldings; ejects on shorter cycle without damage to the moldings.

6 THE IMPROVEMENT: Special Flow Control System of earlier Lesters, is now standard equipment. Injection speed and pressure are controlled separately, offering precise control ranging from zero to maximum speed of injection, according to the material and the moldings section thickness.

RESULT: Provides a wide range of flexibility to the injection system, makes possible high production of heavy section moldings in clear material with high gloss finish and *total* absence of flow and shrink marks.

7 THE IMPROVEMENT: New Lester safety gate (not shown on photograph) is interlocked *hydraulically, electrically* and *mechanically.*

RESULT: No injuries, burns or lost time; no claims; lower insurance cost.

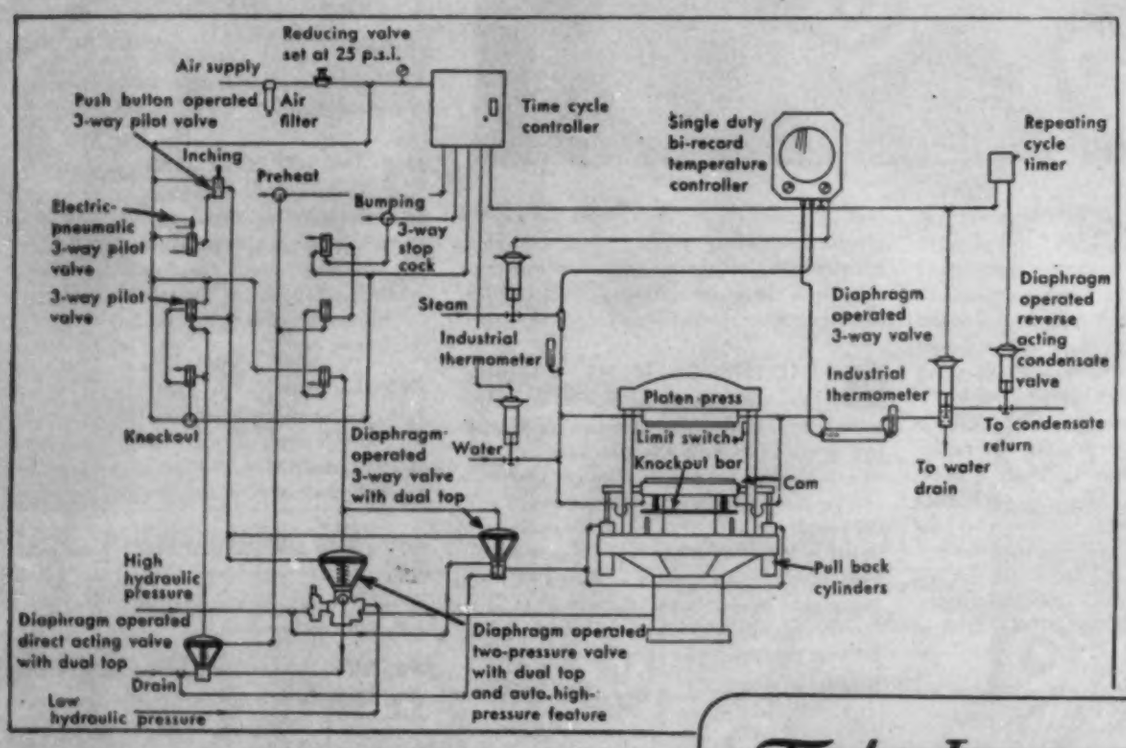
how hot for how long?

A GOOD question, what? In five short words it seems to sum up one of your biggest problems in plastics molding. To do the whole job *automatically* you need automatic control of temperatures as well as time. And that's exactly what we give you with a Taylor Coordinated Control System.

It's simple! All your operator has to do is load the press and push the button. Accurate Taylor Instruments do the rest—right down to maintaining the required platen temperature. The press closes automatically and a valve opens to admit steam into the platens. At the end of your scheduled molding period the steam is automatically shut off and water turned on for automatically timed cooling. After the cooling period the water is shut off and the press opens automatically for unloading. If necessary, "gassing" or "bumping" functions can be carried out automatically, too.

In a nutshell that's how Taylor can put your plastic molding operations on a completely automatic basis. Below is a typical application showing how we team the Taylor Flex-O-Timer, the Taylor Fulscope Controller and accessory equipment together to insure uniform quality in your product.

For the full story ask your Taylor Field Engineer. Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.



Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

Taylor Instruments
MEAN
ACCURACY FIRST
IN HOME AND INDUSTRY

SPLASH! ...but no SMASH

(for this dish is Du Pont nylon)

Visit the Du Pont Exhibit at the National Plastics Exposition, April 22—27, Grand Central Palace, New York City

Here for the first time the plastics industry will display its combined achievements. At the Du Pont exhibit you will see Du Pont Plastics in action, including completely new developments never before shown.

TOO BAD—but down it goes! At least, the dish won't break . . . it's made of Du Pont nylon. What's more, it stands heat—it can be sterilized. It is colorful, light, easy to clean.

Thus a breakage problem that's as old as having babies is solved by a new Du Pont plastic—and by one man's knowledge of its properties.

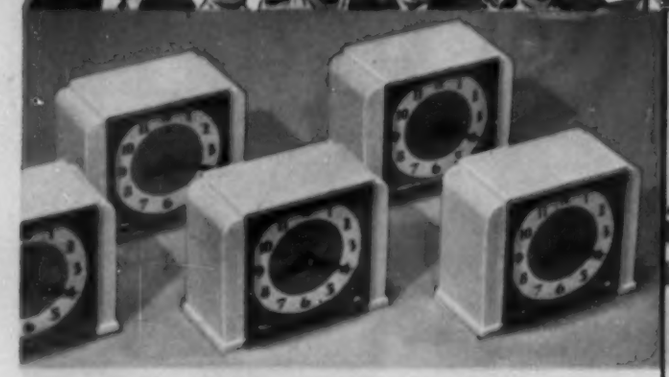
The baby dish is but one recent example of a new use for nylon . . . and nylon is but one of the growing family of Du Pont plastics. What new product have *you* in mind? You'll perhaps be several steps nearer to production if you have information on all the Du Pont plastics. Write for literature. E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Room 364, Arlington, N. J.

Baby dish shown is molded of Du Pont nylon and sold by Columbia Protektosite Co., Inc., Carlstadt, N. J.

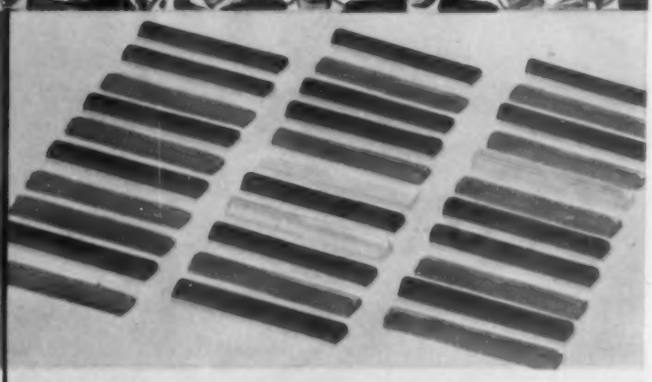
DU PONT
REG. U. S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

Look what a pound of LUSTRON will make...

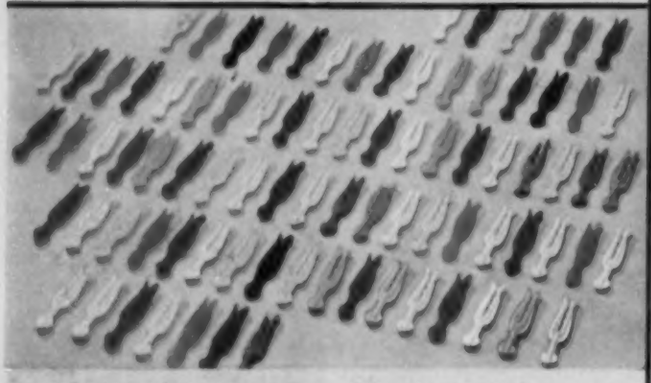
REG. U. S. PAT. OFF.



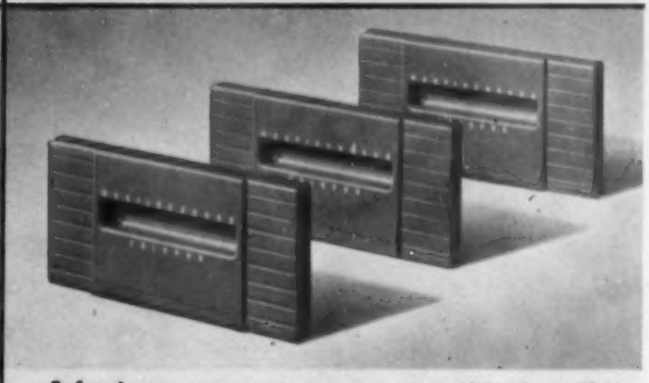
4½ clock housings ...Molded by G.E. Plastics Division, Pittsfield, Mass., for Warren Telechron Company, Ashland, Mass.



or 32 combs ... Molded by Pro-phy-lac-tic Brush Company, Florence, Mass.



or 85 clothespins ... Molded by Formco Plastic Division, New York, N. Y.



or 3 fronts for refrigerator crisper compartments. Molded by Bryant Electric Company, Bridgeport, Conn., for Westinghouse Electric & Mfg. Company, Mansfield, O.

Bright Idea for Businessmen. New phosphorescent Lustron absorbs light during the daytime ... glows 6 to 8 hours after dark. For easy-to-find door hardware, house numbers, handrails, switch plates, clock hands or dials, instrument panels, street markers. This is the first application in a polystyrene molding material of wartime advancements in phosphorescent compounds... more than 200% improvement over prewar phosphorescent thermoplastics.

Are you surprised to see how many finished plastics articles can be made from a single pound of Monsanto's Lustron polystyrene molding compound? If you are—you're not alone!

Lustron has meant *pleasant* surprises for millions of people who have found it bringing better, brighter, more usable products into their homes at retail prices within the reach of everyone.

And, to manufacturers juggling the twin problems of *greater* sales appeal in finished merchandise and *lower* costs out on the production line, Lustron brings these *added* surprises:

- With Lustron there's *no waste.* A pound of raw materials means a pound of finished product.
- There are *no machining or finishing costs.* In a product molded of Lustron, the color, finish and design are inherent.
- Lustron, lightest of all comparable plastics and 1/10 the weight of usual alternative materials, *delivers more material per pound.*
- Lustron molds economically in the fastest mass production techniques.

More of utility, beauty, quality for *less cost*—that's the story of Lustron in a capsule. And it's a story that applies on *either* side of the retail counter ... whether you are customer, or merchant, or manufacturer.

This advertisement is also appearing currently in Saturday Evening Post, April 13 issue; Time, April 1 issue; Newsweek, March 25 issue; Business Week, March 30 issue; United States News, March 29 issue; Fortune, April issue.

MONSANTO
CHEMICALS — PLASTICS

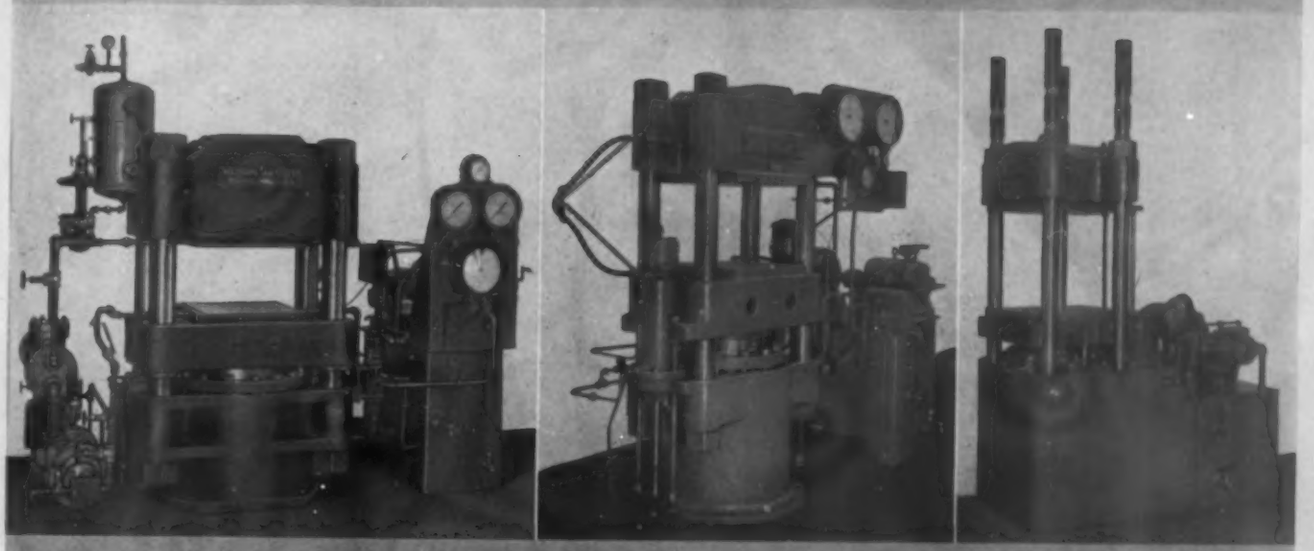
SERVING INDUSTRY... WHICH SERVES MANKIND

WILLIAMS-WHITE PRESSES . . .

. . . designed to apply pressure and heat in the most efficient manner to thermo-setting and thermo-plastic materials.

. . . built in a shop that has had a great many years experience in the fabrication of quality machinery.

COMPRESSION MOLDING • TRANSFER MOLDING • COMPREG

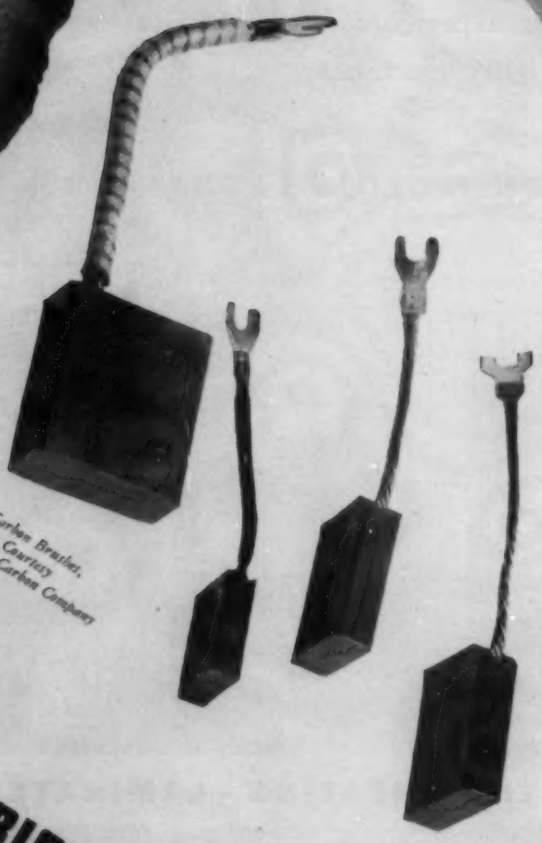


HIGH FREQUENCY HEATING • LAMINATES • PLASTIC PLYWOOD

WILLIAMS, WHITE & COMPANY, MOLINE, ILL.

DURITE

PHENOLIC PLASTICS



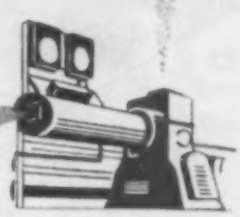
Carbon Brushes, Courtesy Stackpole Carbon Company

INDUSTRIAL RESINS

ADHESIVES & CEMENTS • MOLDING COMPOUNDS

DURITE PLASTICS INCORPORATED • 5000 Summerdale Ave. • Philadelphia 24, Pa.

How to get your *New Ideas* in SHAPE



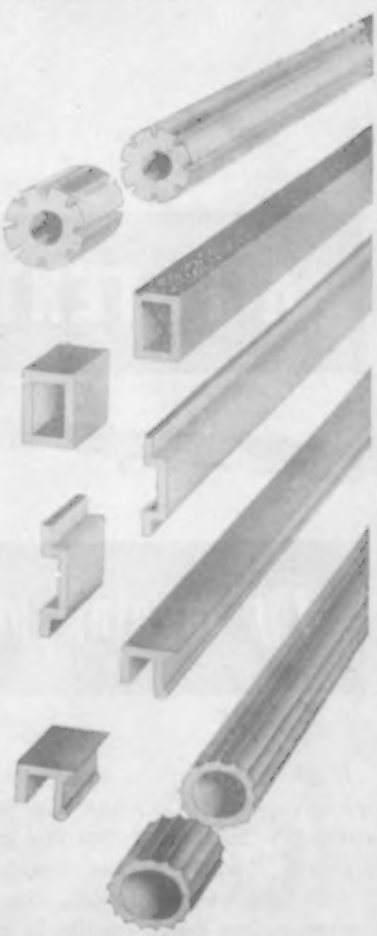
IF your ideas for newly designed products, parts, or packages call for vivid or soft colors, or transparencies . . . examine the advantages of extruded plastics. For, while your ideas take shape by this process, you can gain many other benefits in addition to eye appeal.

YOU SIMPLIFY PRODUCTION
Plastics extrusion is a continuous, economical and speedy process. No highly skilled labor is required. Extrusions require no buffing or polishing.

FLEXIBILITY
National Extruders can be quickly adapted to extrude any type of thermoplastic material. Infinite varieties of shapes can be produced and these can be cut, stamped, punched or bent to produce another vast range of shapes.

PRECISION CONTROL
National Extruders can be depended on to meet exacting mechanical tolerances, and to maintain close control over desired physical properties.

So, think of the component parts of your products in terms of this modern continuous production method. Then write for descriptive data on America's most complete line of extrusion equipment.



NATIONAL RUBBER MACHINERY CO.
General Offices: Akron 11, O.

Plastics
MACHINERY DIVISION

WORLD'S LARGEST PRODUCER OF SYNTHETIC RESINS

RCI

A POTENT TONIC

for lagging production of exterior panel plywood

High wood failure and *low* production costs . . . *high* speed curing and *low* pressure requirements—doesn't that sound like the ideal phenolic resin for panel plywood? Scores of manufacturers will tell you that it proves out in practice, as in theory, for they are getting peak results in curing times of 4 to 6 minutes at 250 to 300°F.—and with pressures of only 75 to 250 p.s.i. Since P-398 Plyophen tolerates a large percentage of extenders and water, and requires no catalyst, glue line costs are minimized. Write direct to the Sales Department at Detroit for additional information.

REICHHOLD CHEMICALS, INC.

General Offices and Main Plant, Detroit 20, Michigan

Other Plants:

Brooklyn, New York • Elizabeth, New Jersey • South San Francisco, California • Tuscaloosa, Alabama • Liverpool, England • Paris, France • Sydney, Australia

SYNTHETIC RESINS • CHEMICAL COLORS • PHENOLIC PLASTICS • INDUSTRIAL CHEMICALS

ORIGINATORS of DRY Process PLASTICS EXTRUSION

MACOID actually invented the process of dry plastics extrusion. We built the first machines to do this work—and we have consistently found new applications for the process in all fields of industry.

This creative and progressive attitude is the foundation of MACOID leadership in extruding.

We are constantly experimenting with new materials. We are constantly expanding the scope of the process. Many industries have learned to depend on MACOID as their source of supply for everything new and different in extruding.

Our engineers are ready to work with yours. You will find them daring and conservative—men who are not afraid to travel uncharted plastics courses—and who are equally unafraid to say "no" when the occasion demands.

We also do injection molding.

DETROIT MACOID CORPORATION

12340 Cloverdale Ave.
Detroit, Michigan

SOCIETY OF THE PLASTICS INDUSTRY · SPI

ORIGINATORS OF
DRY PROCESS PLASTIC EXTRUSION

Reputation for Achievement

Mold Making
Precision Molding
Product Development*

* Patent Holders and Inventors — we maintain Engineers and Designers to help you develop and assist you in financing your ideas into products. Inquiries or consultations involve no obligation.

PIONEERS IN LOW PRESSURE LAMINATING

Thos. J. WHITE PLASTICS Company

SAINT LOUIS 22, MISSOURI

NOW!
YOU CAN COLOR-DIP PLASTICS

BEFORE

DIP-DYED

STREAKED & FINISHED

With "REZ-N-DYE", the latest achievement in dyestuffs, you can turn clear plastics into all colors of the spectrum just as simply as you wash your hands. First you dip your plastic in "REZ-N-DYE", then rinse in cold water. Mottles are applied with soft brush or cotton.

"REZ-N-DYE" colors Lucite; Plexiglas; Cellulose Acetate; Cellulose Acetate Butyrate; Cellulose Nitrate; Ethyl Cellulose; Casein; Reclaimed Acetate Film; some synthetic rubbers; Latex Products; Lacquered Surfaces; some types of Cast Phenolics.

"REZ-N-DYE" is available in 19 beautiful colors. Mottling concentrate is used for tortoise shell effects.

Price of "REZ-N-DYE" is only $3.00 per gallon. MOTTLING CONCENTRATE is $3.00 per quart.

Schwartz Chemical Company

326-328 West 70th Street · New York 23, N. Y.

Tel: SChuyler 4-2126

We've added *HEATRONICS*

One aisle in the plastics molding division at General Industries Company, showing complete Heatronic equipment. Our engineers have the "know-how" to make full use of it.

"Before and after" views of the 2-cavity molding of a plastics agitator for a washing machine. High frequency heating permits better production of such large and complex parts.

These electric iron handles are made in 4-cavity molds. The illustrations show placing the pre-form and unloading the finely-finished part.

to our PLASTICS MOLDING team!

Our customers profit from our extensive installation of Thermex high frequency preheating equipment. This most modern improvement in plastics molding processes enables us to produce more and better pieces per mold cavity. In many instances, the number of cavities needed can be reduced, thus effecting savings in both cost and time.

More important, however, are the resulting improvements in product quality with high frequency preheating. Among the advantages which you will gain are:

Better cure
Uniform density
Less internal stress
Higher gloss
All around improvement of physical properties

This General Industries installation is one of the largest in the plastics molding industry, and additional units are now on order.

Added to our batteries of 150 presses (from 40 tons to 1000 tons), and to the alertness and skill of our engineers, moldmakers and machine operators, high frequency heating brings new power to our plastics molding team and thus enables us to serve you better than ever before.

Our engineers will be glad to work with you on present or future products. Consult us, without obligation, of course.

MOLDED PLASTICS DIVISION

THE GENERAL INDUSTRIES CO.

ELYRIA • • • • OHIO

Call "Your Plastics Department"

No problem is too small for our immediate attention or too large for earnest consideration at "Your Plastics Department."

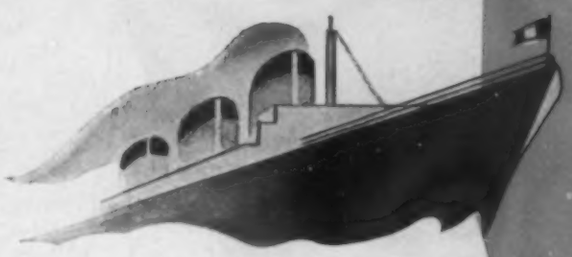
INJECTION MOLDING
MINCOR
"YOUR PLASTICS DEPARTMENT"

MINNESOTA PLASTICS CORP.

366 WACOUTA STREET
ST. PAUL 1, MINNESOTA

FORMICA MEANS SUBSTANTIAL SAVINGS

PER SQUARE FOOT



AFTER having used Formica decorative plastic sheets on furniture, bulkheads, doors, and other surfaces in ships and having observed the results for several years the office of George Sharp, well-known naval architect, declares that each square foot of surface covered with Formica in a ship will save many dollars in the course of twenty years.

This saving is made up of many factors. The surfaces never need to be re-painted or re-finished. That saves labor, and also makes it unnecessary for the space to be withdrawn from use while the work is done. Formica is much easier to keep clean than many surfaces and there are important savings in cleaning time.

While other users of Formica may not have analyzed the situation as closely as the ship builders there is reason to believe that similar savings are possible wherever Formica is used—in hotels, bars, soda fountains, railway, bus, and train terminals, hospitals, public buildings, office buildings and stores.

And of course, in addition to economy, Formica offers eceptional beauty of color and surface, characteristic inlays, Realwood surfaces—it is a thoroughly modern and strikingly attractive surfacing material.

★
★ ★

FORMICA

THE FORMICA INSULATION COMPANY

4673 Spring Grove Avenue

Cincinnati 32, Ohio

RUBBER PLANTATION—AMERICAN STYLE

The only three butyl rubber plants in existence . . . those at Baton Rouge, Louisiana; Baytown, Texas; and Sarnia, Ontario . . . were engineered and built by Stone & Webster Engineering Corporation. In view of the many specialists required for each plant's design, erection and ultimate operation, we also acted as the coordinating agency.

Pictured above, unit #2, butyl rubber plant, Baton Rouge, Louisiana, operated by Standard Oil of New Jersey (Louisiana Division). Largest and first to go into operation; design capacity is 33,000 long tons of butyl rubber per year.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

BIG SHOT!

ONE-SHOT MOLDING PRODUCES THE 7½ LB. BASE OF THIS PLASTIC CABINET

Perhaps you are considering the use of plastics for a housing . . . or some other molded part . . . that calls for exceptional size. Take a good look at this *cabinet . . . the first ever produced to house a combination radio and phonograph. Its sleek, clean lines, its rugged strength and economical cost contribute mightily to the ready-selling appeal of the completed product.

Here is another "first" for Molded Products. The equipment . . . experience . . . skill . . . and "know-how" needed to cope with such unusual assignments are available to you. Submit your plastics problem or product to: MOLDED PRODUCTS CORPORATION, 4533 W. Harrison St., Chicago 24, Illinois.

*Molded for Admiral Corporation

PLASTICS DIVISION

MOLDED PRODUCTS

CORPORATION

How do induction and dielectric heating work?

What are their advantages and limitations?

Where can you use them?

How do r. f. generators compare with motor-generator and spark gap units?

Now you can get the facts with this new book

The answers are all here in this new fact-packed book by Westinghouse . . . including full-color illustrations and 14 case histories of induction and dielectric heating . . . brazing, annealing, hardening, soldering, plastic molding, rubber curing, plywood bonding. Write today for your copy on your business letterhead, please. Ask for B-3620. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-08161

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

Electronics at Work

Uniform Denseness saves Tenseness

. . . in Plastics, too!

YOUR PLASTIC PART can be molded with a uniform density unheard of only a short time ago — before Heatronic molding. It took radio-frequency pre-heating to give the higher plasticity, lower molding pressures and improved cure that render this happy result.

Uniform density of the piece, of course, improves every application —even makes new ones feasible. It permits figuring on reduced stress concentrations, better dimensional stability and increased strength factors—impact, compression, tensile, flexural and dielectric.

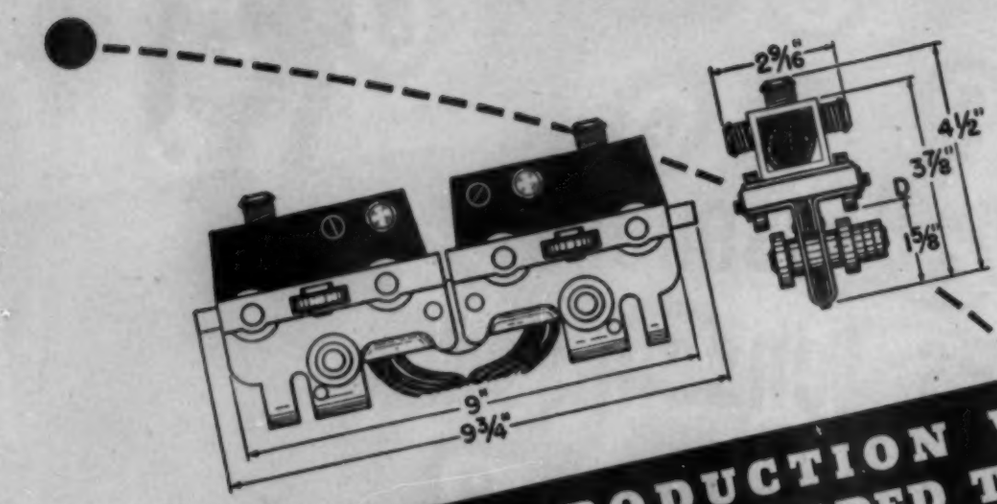
There are plenty of other plus factors derived from Heatronic molding—enough to more than warrant your talking them over with us. Why us? Because Kurz-Kasch offers a molding plant that's grown since birth of the industry—a large and still growing Heatronic installation —*and the experience to go with the equipment.* After all, didn't we pioneer Heatronics for plastics?

You bet we did! Ask a Kurz-Kasch engineer about our complete custom molding service—by phone or by letter.

Kurz-Kasch

For Over 29 Years Planners and Molders in Plastics

Kurz-Kasch, Inc., 1415 South Broadway, Dayton 1, Ohio. *Branch Sales Offices:* New York • Chicago • Detroit Los Angeles • Dallas • St. Louis • Toronto, Canada • *Export Offices:* 89 Broad Street, New York, N. Y.



GET SMOOTH PRODUCTION WITH TAYLOR RECTANGULAR MOLDED TUBING

BullDog Electric Products Company, of Detroit, Michigan, are producers of TROL-E-DUCT—a safe, flexible and mobile feeder system, for carrying electricity to portable electric tools, cranes, hoists and similar, moving, electrically-operated devices.

The square molded tubing used in these Trolleys is supplied by Taylor in full four-foot lengths; fabricated and assembled at the BullDog plant. Low tolerances on O.D. and wall thickness facilitate assembly. Flash lines held to the absolute minimum insure strength at all four corners.

The wartime experience of Taylor Fibre Company in mass production of molded laminated phenolic tubing of irregular and unusual shapes is your assurance of high dimensional, mechanical, and electrical properties you'll find in no other molded tubing of this type.

Wherever the use of Laminated Plastics is indicated, Taylor is your best and quickest source for sheets, rods, tubes or fabricated parts. Write us for samples, technical data, or estimates on work you have in the blueprint or rough sketch stage.

TAYLOR FIBRE COMPANY

LAMINATED PLASTICS: PHENOL FIBRE · VULCANIZED FIBRE—Sheets, Rods, Tubes, and Fabricated Parts

NORRISTOWN, PENNSYLVANIA Offices in Principal Cities **LA VERNE, CALIFORNIA**

Color Photo Courtesy American Cyanamid Plastics

Waterbury Moldings of Merit

Visit Our
"Moldings of Merit" Display
Booth 288 — National Plastics
Exposition, Grand Central
Palace, New York City
April 22-27.

In selecting the right plastic material a broad knowledge, not only of all plastic resins, but also of their adaptability to molding processes is required. As the oldest molder of plastics in America, Waterbury has this knowledge.

Equally important to the plastic parts buyer is the unusual craftsmanship and skill in mold making and design which Waterbury has acquired through the years. Complicated and intricate molding is therefore no problem for Waterbury Companies.

Why not put this wide and diversified experience to profitable use in the production of your plastics parts. Write for further information or plan to talk with our representatives at the National Plastics Exposition.

WATERBURY COMPANIES, INC.

Formerly Waterbury Button Co., Est. 1812

DEPT. B, WATERBURY, CONNECTICUT

CELANESE* PLASTICS

Look to Celanese plastics for important help in obtaining consumer approval of your product. They promote sales because they make friends. Clear through colors, surface lustre and pleasant "touch" are behind the personal appeal of these modern thermoplastics.

Productionwise Celanese plastics offer these advantages . . . molding by the fastest injection and extrusion processes . . . molded surfaces that require little or no polishing . . . formulations to meet specific product applications . . . variety of forms including molding materials, sheets, rods, tubes and films.

Certainly your plans for improved products

LUMARITH* (special and high acetyl cellulose acetate thermoplastic) Molding Materials

LUMARITH EC (ethyl cellulose thermoplastics) Molding Materials, Sheets, Films, Foils

FORTICEL† (cellulose propionate thermoplastic) Molding Materials, Sheets, Rods, Tubes, Films

VIMLITE* (wire or plastic-mesh reinforced cellulose acetate coated plastic glazing) in rolls

*Reg. U. S. Pat. Off.
†Trademark

give these 9 selling points to your products

will call for the best plastic available. There's inspiration for sound design and ideas for increased sales in Celanese plastics. Consult the Celanese technical service staff for practical and impartial advice. Celanese Plastics Corporation, a division of Celanese Corporation of America, 180 Madison Ave., New York 16, N. Y.

LUMARITH CA (cellulose acetate thermoplastic) Molding Materials, Sheets, Rods, Tubes, Films, Foils

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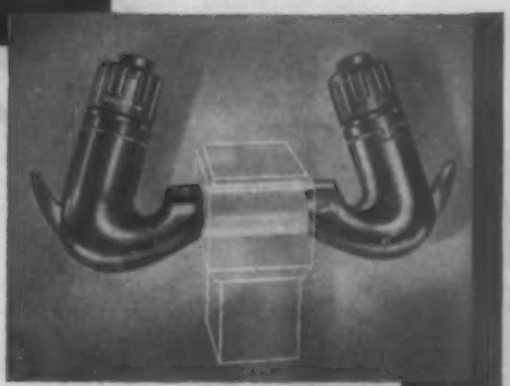
FROM DESIGN TO ASSEMBLY

OUR specialty is the improvement of products and parts through plastics engineering, molding and complete assembly.

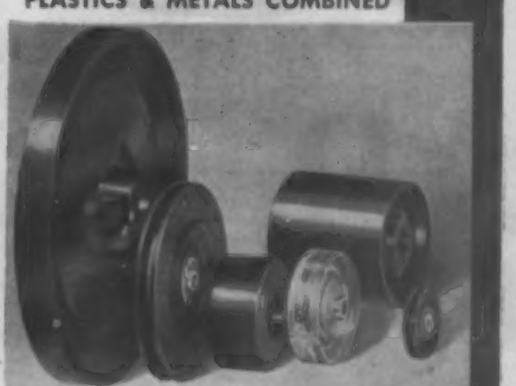
Improved products are obtainable through a wide choice of molding materials, each with specific properties to determine selection . . . through formulations worked out by our plastics chemists for special needs . . . through techniques developed by us in combining plastics with complementary metals . . . through improved molding processes.

If you seek product betterment, let us help you. Our engineers and chemists are trained to consider plastics in relation to your requirements and the product improvement desired. We have the latest equipment for injection, transfer and compression molding. Our production is varied, from simple molded items, produced in volume on high-speed injection presses to intricate assemblies, transfer molded with inserts. For information on our plastics services, write for Folder File MP 4.



MULTIPLE CONTROL GRIPS

PLASTICS & METALS COMBINED



PLASTIC WHEELS for Many Uses

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April 22 through 27

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DOW PLASTICS

—make products

Materials like Ethocel, a Dow plastic, really count today—and not just in profit statements! Products you make and sell are back at the long-term job of building a reputation—*your* reputation—and that will count heavily as competition grows in expanding peacetime markets.

Better products—products that build reputations—start with dependable basic materials like Ethocel. You can depend on Ethocel to make products that stand up, that give customers real money's-worth satisfaction. You can count on Ethocel to keep on building your reputation.

Ethocel is Dow Ethylcellulose. It's a plastic that measures up to the specifications of the toughest jobs—from toys to tool handles, radio cabinets, household appliances and automotive parts. Ethocel and other Dow plastics will help insure your products' success—*your* success in plastics.

ETHOCEL

This table radio is a postwar engineering development. Ethocel was chosen for the cabinet because it is practically unbreakable, offers attractive colors and is pleasing to sight and touch. Furthermore, Ethocel molds these cabinets in one operation, assuring high production.

Ethocel provides color, sturdiness for this telephone and other toys.

Extra toughness of Ethocel is demonstrated by its use in flashlight case.

Lightness and durability recommend Ethocel for hearing aid cases.

Let's work it out together

Success in plastics is measured only in end products. It calls for the combined efforts of manufacturers, designers, fabricators and raw material producers. Dow is ready to do its part. Save time and money—call on Dow and *get the most out of plastics.*

...with REPUTATIONS!

STYRON

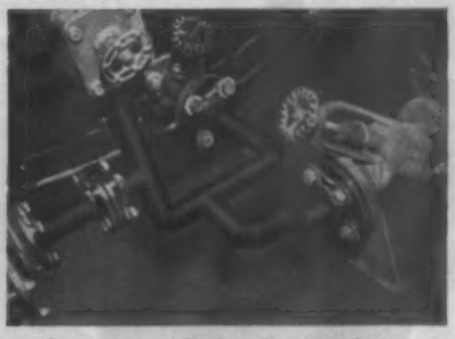
Styron is accepted as the measuring stick for plastic dependability in many fields. It offers unsurpassed brilliance, in beautifully clear, translucent or opaque form, which spells magnetism for a variety of quality products. It has excellent electrical properties, high resistance to acids and alkalies, low water absorption and good dimensional stability, even at low temperatures. Its low specific gravity means more moldings per pound. This, combined with low price, gives real manufacturing economy.

SARAN

Saran gives top performance in a wide range of applications. In extruded monofilaments it's making colorful fabrics with amazing wearing qualities for upholstery, luggage, shoes and draperies. It's used for long-lasting window screen that simply can't rust. It makes tubing and heavy pipe that is practically immune to corrosion and most chemicals. Saran Film provides extraordinary protection for products in shipment or in storage. Saran also is recommended for many molded products.

Accuracy in engineer's scale emphasizes Styron's dimensional stability.

Sales-stimulating beauty is created by Styron for electric shaver case.



In many specialized applications, Saran pipe cuts replacement costs.

Styron's smooth surfaces mean improved sanitation for this Kiddie Seat.

Colors that won't wear off add satisfaction to handbags woven of Saran.

Strong and pliable, Saran Film packages protect against rust and corrosion.

Ice compartment door of Styron illustrates its structural usefulness.

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PLASTICS

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REPORT...
WITCO BARIUM, CALCIUM, LEAD, AND ZINC STEARATES
are highly effective as lubricating agents in plastic and rubber molding operations. Because these carefully processed stearates are of uniformly fluffy texture and have no tendencies to form greasy lumps, finished products can be withdrawn smoothly and cleanly from the molds. Witco Barium Stearate has the additional advantage of an extremely high melting point—257°C—which permits its use at temperatures at which other stearates are not effective. Witco Barium, Calcium, Lead and Zinc Stearates impart improved working qualities to formulations in which they are contained. Send for samples today.

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are Perpetuated in

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"Three Dimensional" Plastics

Your trade-mark or trade name on your product may be only a means of identification. If it is custom molded of ERIE RESISTOR "Three Dimensional" plastics, it becomes a spot of beauty, that brings your symbol to the attention of the buyer with the sparkle of a rich jewel, and enhances the sales appeal and the sales value of your product.

There is a depth of color in Erie Resistor "Three Dimensional" plastics that is unobtainable by any other molding method. Lettering or designs stand out in strong relief from a colored background, in gold, silver, crystal or any color in the rainbow, forever protected from fading or erasure.

If it's plastics, your inquiry for a name plate, a package, a functional part of your product will have our immediate and full attention, and the execution of your order will be in the hands of imaginative designers, skilled engineers, and experienced workmen.

Visit Our Booth

No. 93

at the National Plastics Exposition

GRAND CENTRAL PALACE NEW YORK

APRIL 22 - 27

Plastics Division

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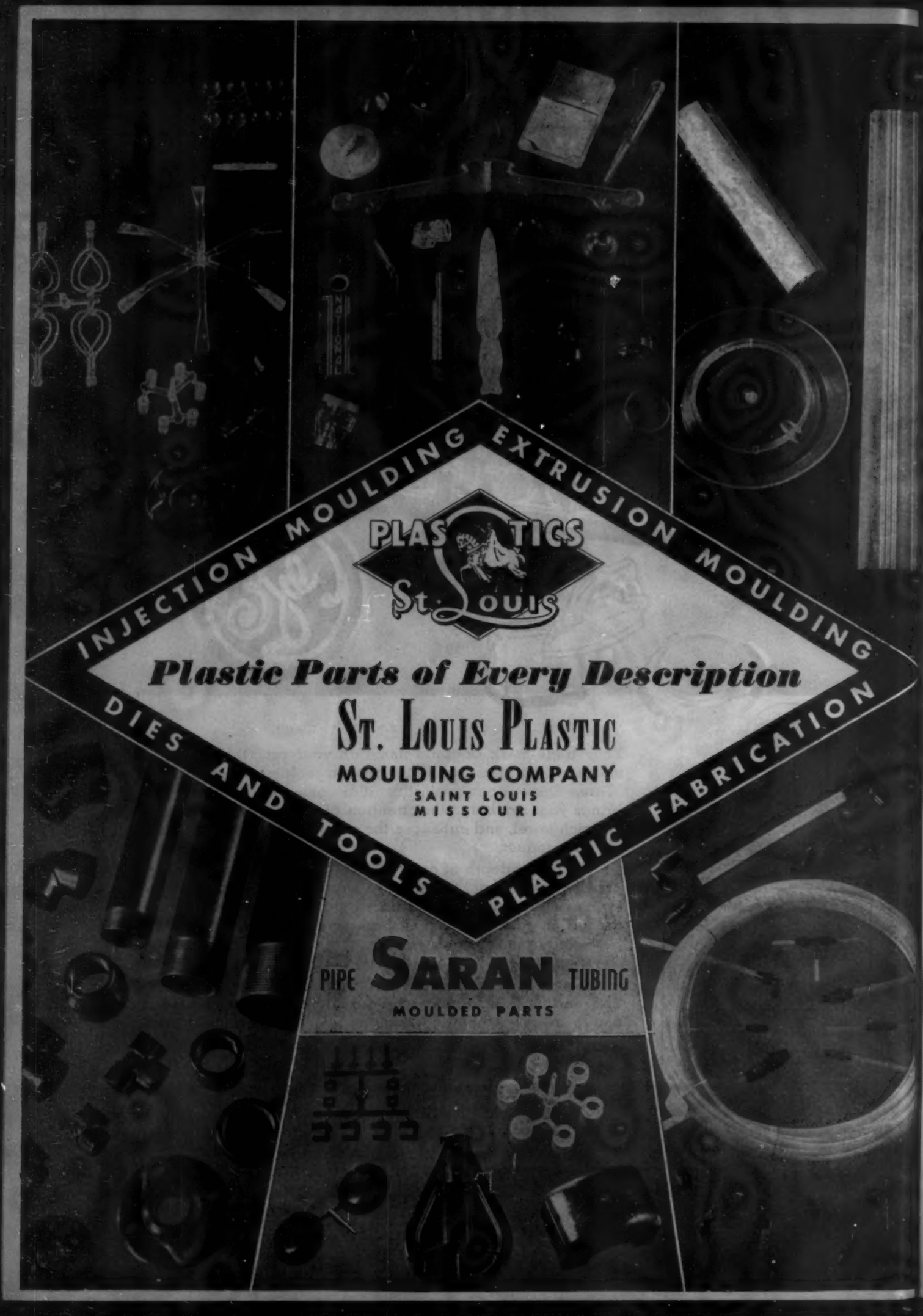
LONDON, ENGLAND . . . TORONTO, CANADA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PLASTIC FABRICATION
PIPE SARAN TUBING
MOULDED PARTS

Aluminum-Plastic Teamwork scores again in this modern furniture . . .

"What's the ideal seat material for modern kitchen and dinette furniture?" asked the Pittsburgh Range Company, McKees Rocks, Pa. The answer proved to be strips of gaily-colored vinyl plastic sheet, interwoven, easily applied, easily cleaned, comfortable and long-lived.

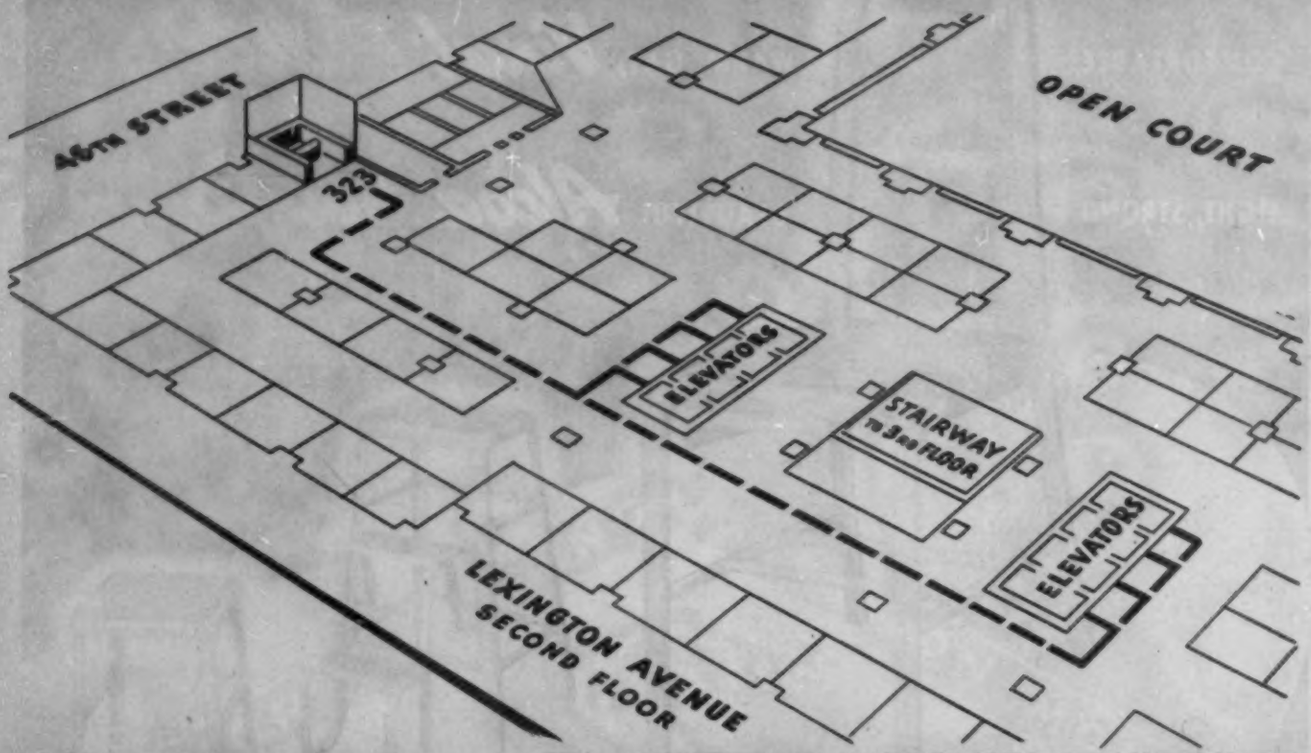
"And the most modern material for the frame?" Why, Alcoa Aluminum. It's light. It's strong, and easy to fabricate into a structure that stays sturdy, rattle-free, squeak-free. And look at the finish! That soft lustre is a special baked aluminum lacquer finish which was worked out by Alcoa engineers in co-operation with Pittsburgh Range Company.

The result? Pull up a chair, with your finger tips (for Alcoa Aluminum cuts weight in half), and no matter how long you sit and think, you can only agree that teamwork between these two modern materials paid off handsomely. How can *you* team up with Alcoa Aluminum? Inserts? Decorative touches? Structural parts? You'll lose nothing of plastics' advantages, for aluminum is *plastics' best friend in metals.* It offers the light weight, corrosion-freedom, and ease of fabricating that plastics are famous for. Consult our nearest sales office, or write ALUMINUM COMPANY OF AMERICA, 2175 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

Follow the DOTTED LINE to . . .



TAYLOR OF MILWAUKEE

HI-EFF

MOLDED PLASTIC AND RUBBER PRODUCTS

BOOTH 323

NATIONAL PLASTICS EXPOSITION

Grand Central Palace, New York City

April 22nd-27th.

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In filling export orders be sure that you are doing a complete packaging job . . . be sure that your corrugated shipping boxes provide that extra margin of safety that protects your products against the dangers of distance shipping, thereby eliminating costly damage payments.

EXPERTLY ENGINEERED
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A correctly engineered shipping box combines maximum protection with maximum economy . . . eliminates the need for over-packing. H & D shipping box engineering . . . that certain skill that comes from the H & D Package Laboratory, makes sure that your merchandise will arrive safely, and ready for quick selling . . . no matter how far it travels or how rough the journey. See for yourself how H & D packaging experts can help you plan engineered boxes which assure you safer shipping, increased customer good will, extra sales for your merchandise. Write for the booklet, "How To SHIP in Corrugated Boxes." The Hinde & Dauch Paper Company, Executive Offices, 4602 Decatur St., Sandusky, Ohio.

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TRAINING

in step with

INDUSTRIAL TRENDS

Plastics Institute training is predicated upon two basic principles: A. Thorough study of accepted practices and materials. B. Evaluation of current problems, new materials and new techniques.

Typical Mold Design Projects include a COMPRESSION MOLD SERIES: Semi-automatic mold for tumbler, single cavity with stripper plate construction. A four cavity mold of a coil-bobbin. A connection plug, twelve cavity mold. INJECTION MOLD SERIES: Handle, two cavity mold with sectional elevation with auxiliary views showing constructional features. Two cavity fully automatic mold of syrup cap with sectional elevation and plan showing gear train and operational details. Six cavity fully automatic mold for photographic tongs. Use of D.M.E. layouts, automatic rods and gears, angle pins, etc., and subjects such as lipstick holder, slide fastener, compact, etc. TRANSFER MOLD SERIES: Connecting plug, showing detail with recalculated dimension taking care of mold shrinkage. Two cavity mold of compass case, also sectional elevation and detail of core and ejection mechanism. EXTRUSION MOLD SERIES: Tubing die, showing details of mandrel, bushing and holder.

In addition to mold design, other phases of plastics thoroughly covered at Plastics Institute include: Materials, casting, high-frequency pre-heating, fabricating and laminating. Testing methods and molding practices are taught on industry type equipment.

Your inquiries regarding the Home Training, Forums and Resident Technology Courses are welcomed.

WRITE DEPT. MP6-4

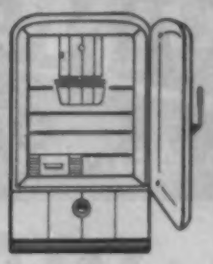
VETERANS as well as CIVILIANS now training with Plastics Institute, upon graduation, are qualified and worthy of your consideration for employment in the various branches of the plastics industry. Write to the nearest branch of Plastics Institute stating your requirements. We will endeavor to select a graduate best qualified to meet your needs.

Plastics
INDUSTRIES TECHNICAL
INSTITUTE

Francis A. Gudger, President — John Delmonte, Technical Director

NEW YORK- 122 EAST 42ND ST. • CHICAGO- 221 NORTH LASALLE ST. • LOS ANGELES- 1601 SOUTH WESTERN AVE.

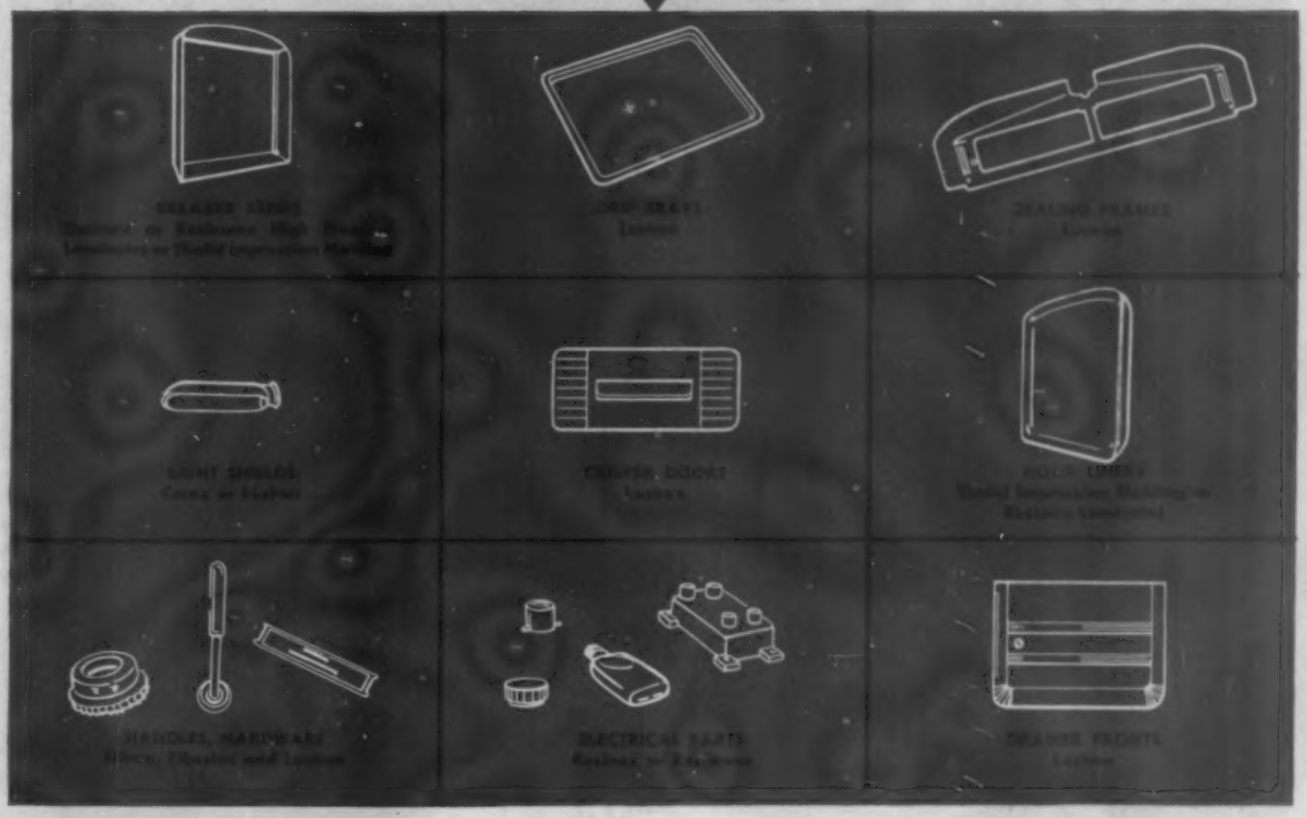
in "Refrigerator plastics"



..... here's headquarters

MONSANTO PLASTICS
SERVING INDUSTRY ... WHICH SERVES MANKIND

and HERE'S WHY...



While Monsanto does not make every kind of plastic, *it does make a plastic especially suited to every refrigerator application* . . . some of them exclusively.

No. 1 plastic for refrigerator applications is, of course, Monsanto's polystyrene, Lustron, offering low temperature strength. Add jewel-like color—resistance to food acids, cleansing agents, and water—lack of taste and odor—dimensional stability—and low cost and you see why virtually every maker of household refrigerators today is using Lustron.

But Lustron is only the beginning of Monsanto plastics that are research-tailored for manufacturers in this special field. For example, there's Thalid for impression molding of breaker strips, door liners and possibly other large components . . . there's Nitron and Fibestos for tough, beautiful door hardware (in average family, refrigerator door is opened and closed 40–50 times per day!)...etc.

If you would like complete technical data on any Monsanto plastic . . . or if you desire the help of Monsanto's Plastics Technical Council, a group of ten plastics experts, write today to "headquarters" MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts.

The broad and versatile family of Monsanto Plastics includes: Lustron® polystyrenes • Carex® heat resistant thermoplastics • Vinyl acetals • Nitron® cellulose nitrates • Fibestos® cellulose acetates • Thalid®, for impression molding • Resinox® phenolics • Resimene® melamines • Forms in which they are supplied include: Sheets • Rods • Tubes • Molding Compounds Industrial Resins • Coating Compounds • Vuepak® rigid, transparent packaging materials.

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MONSANTO PLASTICS
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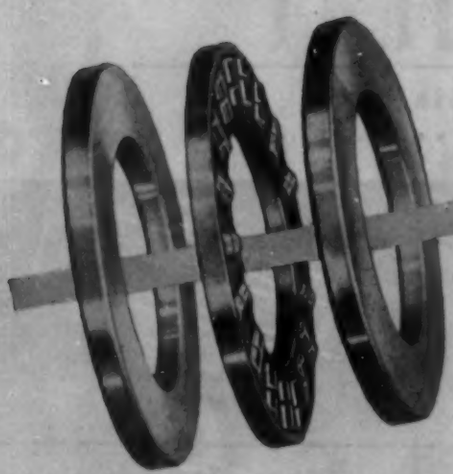
The BIG SAVING is in Man and Machine Hours



ROLLWAY RIGHT-ANGLE LOADING

means fewer shutdowns for bearing service and replacement

In general, right-angle loading gives Rollway Roller Bearings a longer life expectancy. That's a saving in itself, but it is relatively unimportant when you consider the enormously greater savings in man hours and machine hours which this longer bearing life provides. Machines run at peak production for longer periods. Fewer skilled men stand idle while bearings are serviced or replaced. There are fewer interruptions of the production schedule.

The Advantages You Get From Right-Angle Loading

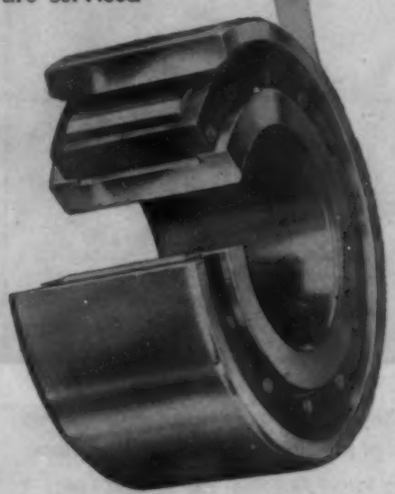
1. Solid cylindrical rollers of greater roller mass and uniform roller cross-section . . . greater resistance to shock loads and vibration . . . longer life expectancy under continuous heavy-duty service.

2. All loads carried at right-angles to the roller axis. No compound loads, no oblique loads, and no resultants of oblique loads can be brought to bear.

3. No wedging of rollers . . . no pinch out . . . less roller end-rub and wear-back . . . less rubbing friction.

4. Only pure radial or pure thrust loads can be imposed upon any single bearing assembly. Unit pressures per roller are substantially reduced.

5. Greater load-carrying capacity in any given dimension. Housings can be smaller and more compact. Weight of design can be reduced.

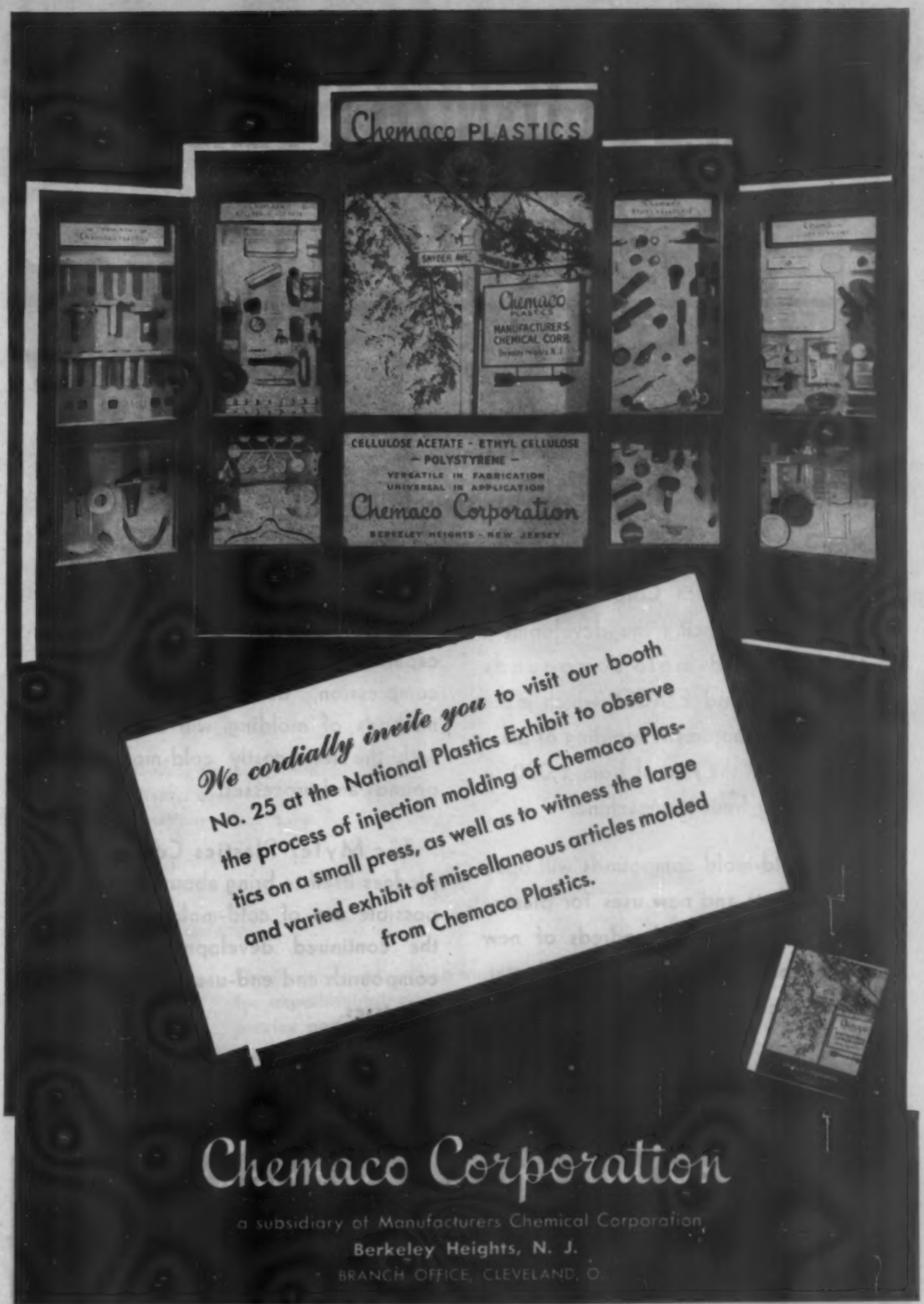


Select Bearings For the Job They Do

Our engineering specialists will gladly make necessary calculations, drawings and supply the information required for a complete understanding of the problem. No charge or obligation.

ROLLWAY CYLINDRICAL ROLLER BEARINGS

SALES OFFICES: Philadelphia • Boston • Pittsburgh • Youngstown • Cleveland • Detroit • Chicago • St. Paul • Houston • Tulsa • Los Angeles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We cordially invite you to visit our booth No. 25 at the National Plastics Exhibit to observe the process of injection molding of Chemaco Plastics on a small press, as well as to witness the large and varied exhibit of miscellaneous articles molded from Chemaco Plastics.
Chemaco Corporation
a subsidiary of Manufacturers Chemical Corporation
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2 NEW COLD-MOLD PLASTICS

Products of 20 years of Research & Development

MOOREX
EMCO

For

LOW COST—HIGH SPEED—AUTOMATIC MOLDING

The Myler Plastics Corporation takes pride in announcing the development of its new cold-mold compounds MOOREX and EMCO, which make possible the automatic molding of plastic articles at the rate of from 1,000 to 30,000 per hour per machine.

These cold-mold compounds will open new markets and new uses for plastics and make possible hundreds of new plastic products designed for better, more cheerful, less costly living.

It is our belief that cold-molding is in its infancy; that many products now capable of manufacture only by present compression, transfer and injection methods of molding will be possible with the less costly cold-mold compounds and processes.

The Myler Plastics Corporation pledges itself to bring about the widest possible use of cold-molding through the continued development of new compounds and end-use manufacturing processes.

For Details Write to Executive Offices

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The Pacemaker

A Profit Maker

A Precise and Efficient Laboratory Press

★

One and Two-Ounce Capacities

★

Designed for Experimental, Educational, and small Production Use.

Your enthusiasm for this machine at the Plastics Show in Detroit was extremely gratifying to us.

Sav-way

The Pacemaker injection molding machine is designed particularly for experimental, educational, and limited production use. It is a precise and efficient laboratory press, ideally suited to research, development, and instruction. It is a perfect press for making small scale pressing tests, preparation of samples, and testing single cavity molds. An important advantage is the small amount of material required for the pressing operation, and the elimination of waste. Available in 1-ounce and 2-ounce models.

Complete technical details of the Sav-Way Pacemaker will be furnished upon request.

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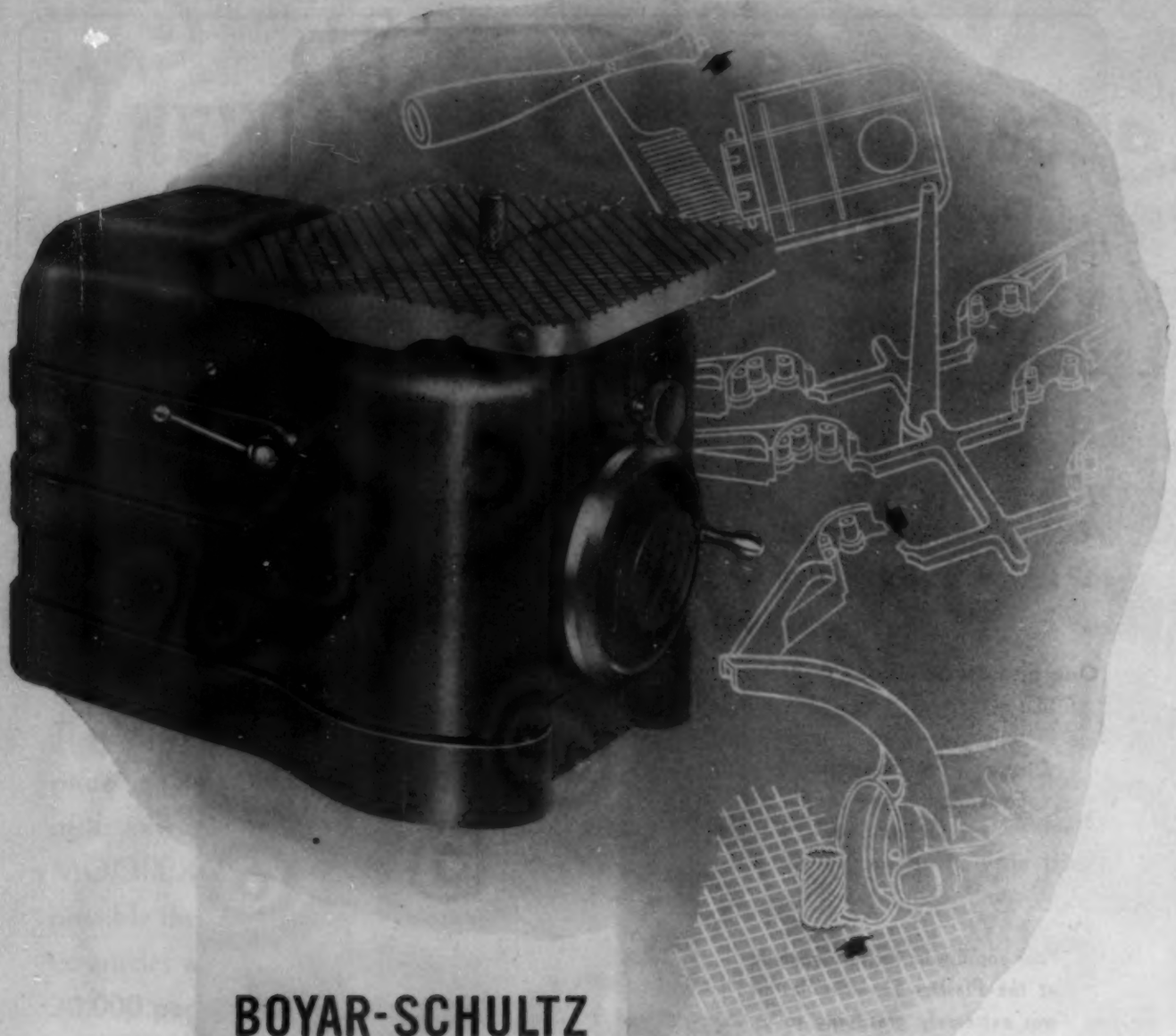
BOX 117, HARPER STATION, DETROIT 13, MICHIGAN



BOYAR-SCHULTZ
No. 1 Profile Grinder

. . . for Fast, Accurate Removal of Rough Gates and excess Flash from Plastic Parts

Workers in Plastics have long experienced difficulty in quickly removing rough gates and excess flash that sometimes appear on molded plastic parts. Abrasive belts and grinding wheels used for this purpose, quickly load up and cease to function.

Boyar-Schultz No. 1 Profile Grinder, used with high speed burrs or cutters will quickly remove excess material quickly and cleanly. These cutters turning at high speed are self cleaning and long wearing. With this method, frequent and costly changing of belts and dressing of wheels is eliminated.

This Grinder is a double purpose Tool. It is also most valuable in the tool and die shop for grinding intricate profiles and shapes encountered in tool and die making.

WRITE FOR CIRCULAR

BOYAR-SCHULTZ
CORPORATION
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(Translucent table lamp, molded for All-Lite Manufacturing Co., Chicago)

Plastics . . . *in a new light*

This lamp, a new departure in household illumination, also casts its light on our molding versatility. It serves as an excellent example of the ideal combination of beauty and functional dependability possible through the *correct* use of plastics. The lamp radiates light the entire length of its translucent shaft instead of just from a conventional type bulb at the top. Its design, while beautifully simple, required a high degree of our imagineering* skill to execute.

If you have a product with a new departure—a product that would reach its highest degree of excellence through the *proper* use of plastics, bring it to us. The result will bring you plastics in a brilliant new light.

*Imagination plus engineering skill.

Write on your letterhead for the new Injection Molded and Extruded Plastics catalogue. Or, for detailed information about MILLS PLASTIC* pipe, tubing and fittings, write for circulars containing data and illustrations.

*Trademark Reg.

Visit our exhibit, Booth No. 34 at The National Plastics Exposition, Grand Central Palace, April 22 to 27.

ELMER E. MILLS CORPORATION

Molders of Tenite, Lumarith, Plastacele, Fibestos, Lucite, Crystallite, Polystyrene, Styron, Lustron, Loalin, Vinylite, Geon, MILLS PLASTIC*, Saran and other Thermoplastic Materials

153 WEST HURON STREET • CHICAGO 10, ILLINOIS

Every time we start a new run now you have to stop and adjust the resin! That gives us downtime and high costs . . .

"Why spend *our* time making a resin do the job?"

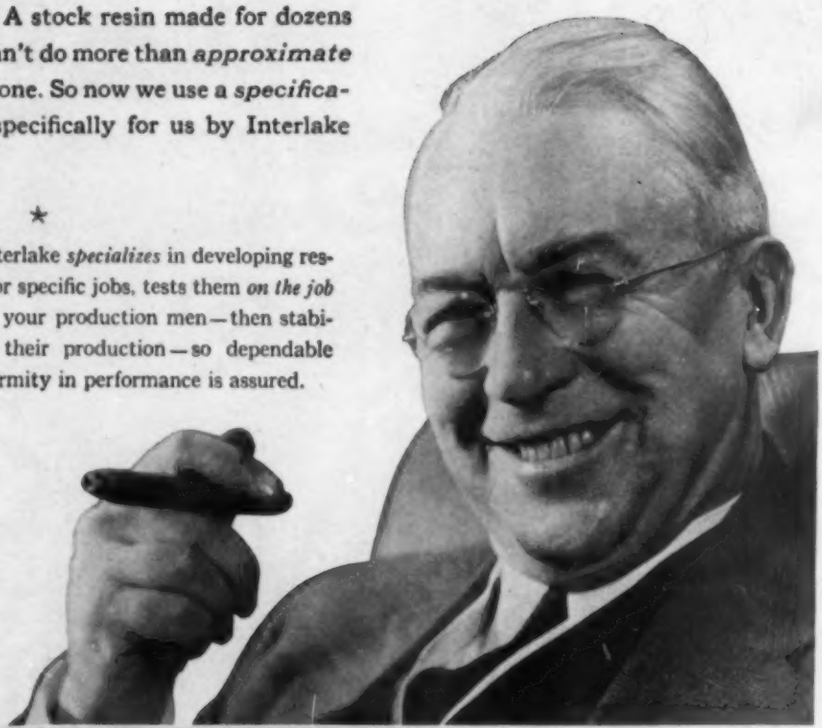
THE BOSS WAS RIGHT. A stock resin made for dozens of similar applications can't do more than *approximate* the requirements of any one. So now we use a *specification* resin—developed specifically for us by Interlake and—*it works!*

* * *

INTERLAKE takes full responsibility for fitting the resin to the job. Because—adjustment of a resin to any specific application is an *exacting* chemical operation and is properly the responsibility of the resin producer.

Fortunately, in expert hands, the chemicals from which phenolic resins are obtained can be varied in an almost infinite number of combinations—to produce resin properties *precisely fitted* to any one of a wide range of applications.

Interlake *specializes* in developing resins for specific jobs, tests them *on the job* with your production men—then stabilizes their production—so dependable uniformity in performance is assured.



IF YOU HAVE A RESIN PROBLEM... draw freely upon the wide experience of Interlake. We will gladly work with you on any resin problem, or discuss with you the possible advantage of using resins in any operation or process. Write Interlake Chemical Corporation, Plastics Division, 1911 Union Commerce Building, Cleveland 14, Ohio.

INTERLAKE CHEMICAL
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• PRODUCTS FROM COAL •

Specificity IN RESINS

Positive Fastening . . .

FOR YOUR PLASTIC PARTS!

Speed assembly, improve product performance and reduce costs with Shakeproof Type 25 Thread-Cutting Screws. Each screw cuts its own thread into plastics as you drive it! Eliminates inserts!

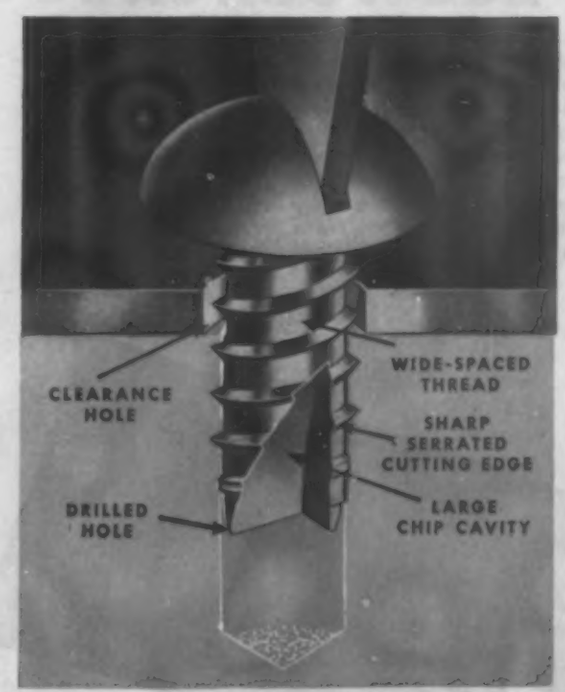
The unique cutting action of the Type 25 provides freedom from dangerous stresses or strains that are likely to cause fractures in molded plastics. Because the screw remains in the thread it has cut itself, a perfect mating thread is assured which results in a snug, tight fit.

Write today for free sample test kit—contains a variety of sizes and head styles. Ask for Kit No. 10.

SHAKEPROOF

TYPE 25

THREAD-CUTTING SCREWS



SHAKEPROOF inc.

"fastening Headquarters"

Distributor of Shakeproof Products Manufactured by ILLINOIS TOOL WORKS

2501 North Keeler Avenue, Chicago 39, Illinois

Plants at Chicago and Elgin, Ill. In Canada: Canada Illinois Tools, Ltd., Toronto, Ont.

Los Angeles Office: 5670 Wilshire Blvd., Los Angeles 36, California

Detroit Office: 2895 E. Grand Blvd., Detroit 2, Michigan

CELLULOSE ACETATE
CELLULOSE NITRATE
ETHYL CELLULOSE

Most useful of all Plastics

because they're COLORFUL

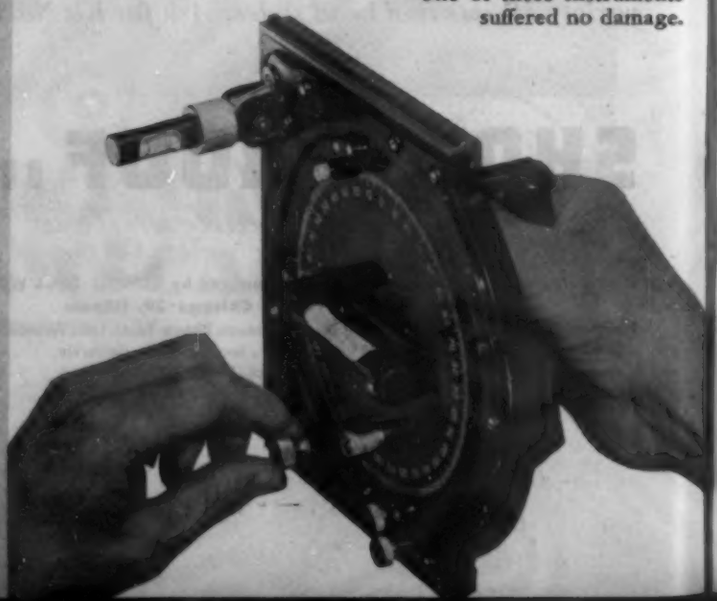
Color to help you sell better . . . color to identify your products easier . . . color to meet varied styling needs. The cellulosics meet every color requirement with an unlimited range of pastels, opaques, translucents, transparents, whites, ivories, pearls, or even mottles. The high luster of these colors remains undimmed by constant handling or cleaning, grease, moisture. With cellulose acetate, cellulose nitrate, or ethyl cellulose, products ranging from molded housings to extruded wire insulation can be permanently attractive as well as durable.

because they're ECONOMICAL

The cellulosics cost less to buy (more material per pound), cost less to form into finished products—with multiple-unit, high-speed injection molding. And there is no loss of materials in the molding operation. Economies such as these mean more attractively priced consumer items, like this colorful, easily cleaned handbag. Comprising 200 mar-proof cellulose acetate "discs", it is rapidly molded—then ready for assembly—36 "discs" at a time.

because they're STABLE

Collectively, the cellulosics are stable in form and finish over a wide and useful range of temperatures or exposures to moisture, solvents, acids, alkalies. This propeller protractor is an outstanding example of both the dimensional stability and impact strength of high-acetyl cellulose acetate. With finely spaced calibration *molded in*, it functions accurately over a temperature range of −58° to +158°F. Although accidentally dropped 60 ft., one of these instruments suffered no damage.



because they're TOUGH

The cellulosics are outstanding where toughness must be combined with light weight. This is one of the reasons why millions of thin-walled soap and toothbrush boxes found in PX's and ships' stores were molded from cellulose acetate . . . why parachute-borne cargo containers were formed from cloth-laminated cellulose acetate—why movie film continues to be made from cellulose acetate or cellulose nitrate. Further evidence of toughness and impact strength is found in metal-shaping dies cast from ethyl cellulose, and cellulose nitrate billiard balls.

because they're TRANSPARENT

Available in crystal-clear, as well as colorful types, the cellulosics bring extra sales-appeal as well as lightweight toughness to a thousand diversified products. These containers, formed by a special mass-production process, let buyers *see* what they buy without opening the package. They may have walls as thin as one eight-thousandth of an inch. Labels are quickly printed on. Other packages can be rapidly fabricated at low cost by injection molding, extrusion, blowing, or forming from sheets.

because they're LIGHT WEIGHT

Among the lightest of all plastics, the cellulosics offer a broad range of other useful properties. For example, this aircraft cockpit ventilator—molded from cellulose acetate. Although 17 inches long, it weighs but 16 ounces. It ignores wide temperature extremes, lubricating oil, hydraulic fluid, impact shocks. Also typical weight-savers are cellulose acetate bottles, often used for air-shipment of pharmaceuticals. Blown like glass, they are one-fifth the weight, have 15% thinner walls, yet are virtually shatter-proof.

HERCULES

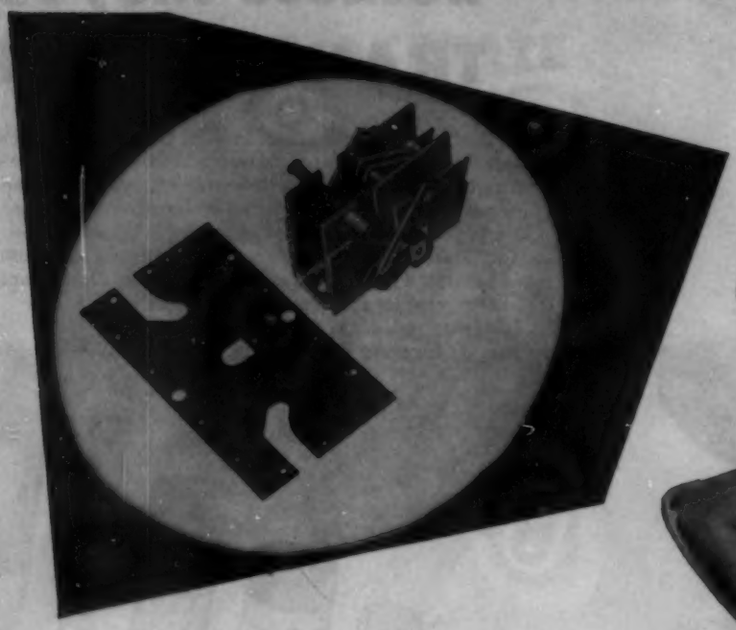
CELLULOSE ACETATE
CELLULOSE NITRATE
ETHYL CELLULOSE

For general-purpose production plastics

Hercules does not make plastics or molding powder, but supplies the high-quality cellulose derivatives from which they are made. For data, please write to

HERCULES POWDER COMPANY
INCORPORATED
916 MARKET STREET, WILMINGTON 99, DELAWARE

CP-48



Shapely

Post-Formed Phenolite chassis for high voltage circuit breaker. All holes and cut-outs are punched in the flat blank *(foreground)* before post-forming in channel shape. Use of Phenolite chassis in place of metal eliminates insulation of each separate part of assembly.

POST-FORMED
PHENOLITE*
shapes profitable production and new products

There are opportunities for you in Post-Formed Phenolite—the laminated plastic that simplifies production and offers countless new applications for profitable-selling products!

Economical to produce, Post-Formed Phenolite parts are made in a matter of minutes. Practically any shape or form may be obtained simply by heating the sheet material a few seconds, then forming in low-cost wooden molds with standard press equipment. No sanding or "flash" removal is necessary. Fabrication may be done before or after forming.

Phenolite is extremely light in weight (about ½ that of aluminum); yet it has remarkable mechanical and impact strength. It possesses good machinability . . . is an excellent electrical insulator . . . resists heat and moisture . . . is resistant to abrasion . . . and is not affected by solvents and oils.

Find out some of the many ways in which this versatile material can be used. Write for full information and the assistance of one of our trained engineers.

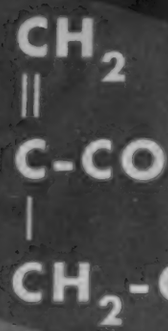
NATIONAL VULCANIZED FIBRE CO.

OFFICES IN PRINCIPAL CITIES

WILMINGTON, DELAWARE

*FORMABLE THERMOSETTING SHEET MATERIAL

ITACONIC ACID



Molecular Weight . . .	130.10
Appearance	White, crystalline, solid
Melting Point	167-168°C.
Solubility in Water . . .	At 20°C. a saturated solution contains 7.6 grams of Itaconic Acid per 100 grams of solution.

This unsaturated dibasic acid, now available in research quantities, offers many possibilities as a raw material in the field of chemical industry.

It can be used as a raw material in the preparation of resins of various types.

Its esters can be polymerized to yield colorless, transparent plastics of varying characteristics, depending on the alcohol with which the acid is combined. They can also be co-polymerized with other monomers, opening a wide range of possibilities.

Its structure indicates that it might prove a useful raw material for the preparation of wetting agents.

It can be converted to citraconic or mesaconic acid and forms an anhydride.

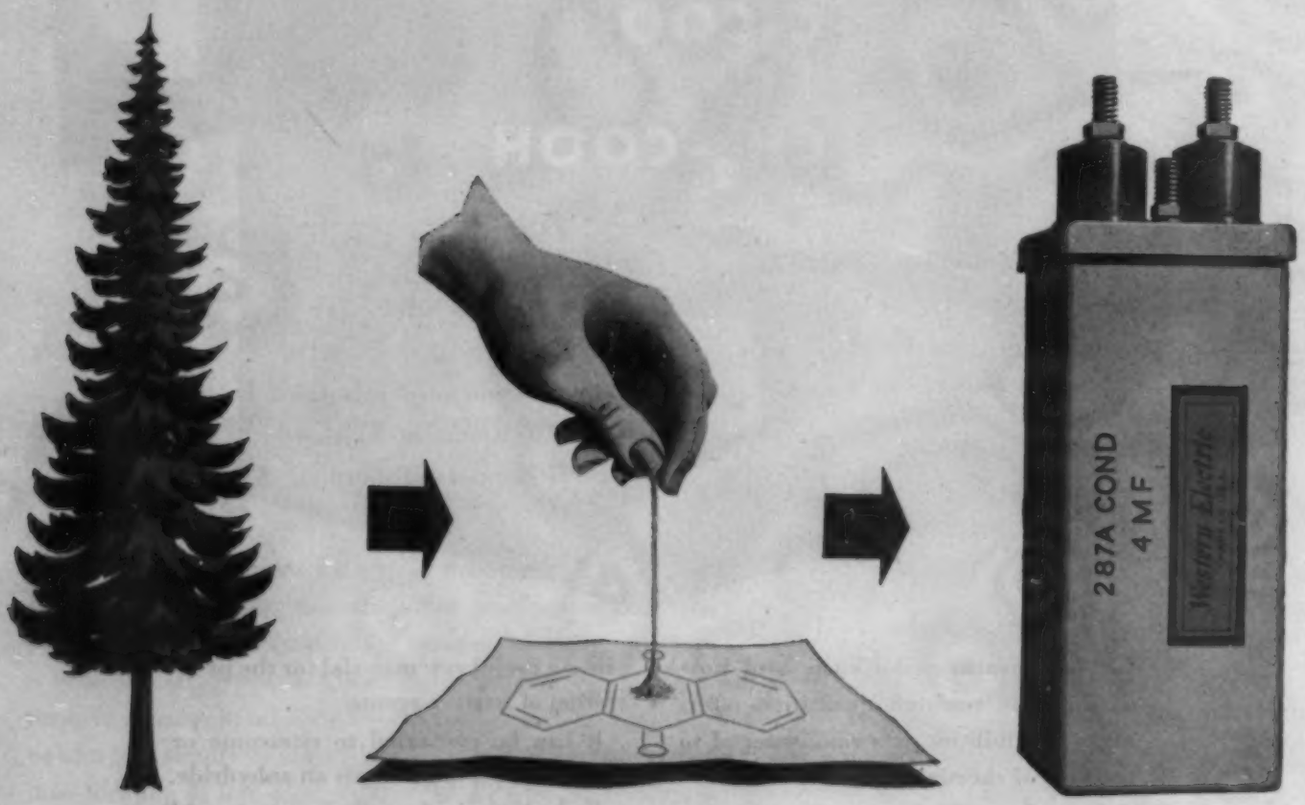
Reduction yields methyl succinic acid which, in turn offers other possibilities as a raw material.

Itaconic Acid is not yet being prepared in commercial quantities, but limited amounts are available for laboratory research.

For samples and further information, please inquire of Chas. Pfizer & Co., Inc., 81 Maiden Lane, New York 7, N. Y.; 444 West Grand Ave., Chicago 10, Ill.

PFIZER *Manufacturing Chemists Since 1849*

LIFE-EXTENSION BY THE GRAM



CRUCIAL links in every wire and radio system are paper capacitors — rolls of impregnated paper and metal foil. At least one is in every telephone — and more than 100 million are in the Bell System. A single failure can sever a telephone call, put a costly line out of service. So finding out how to make capacitors stand up longer is one of the big jobs of Bell Telephone Laboratories.

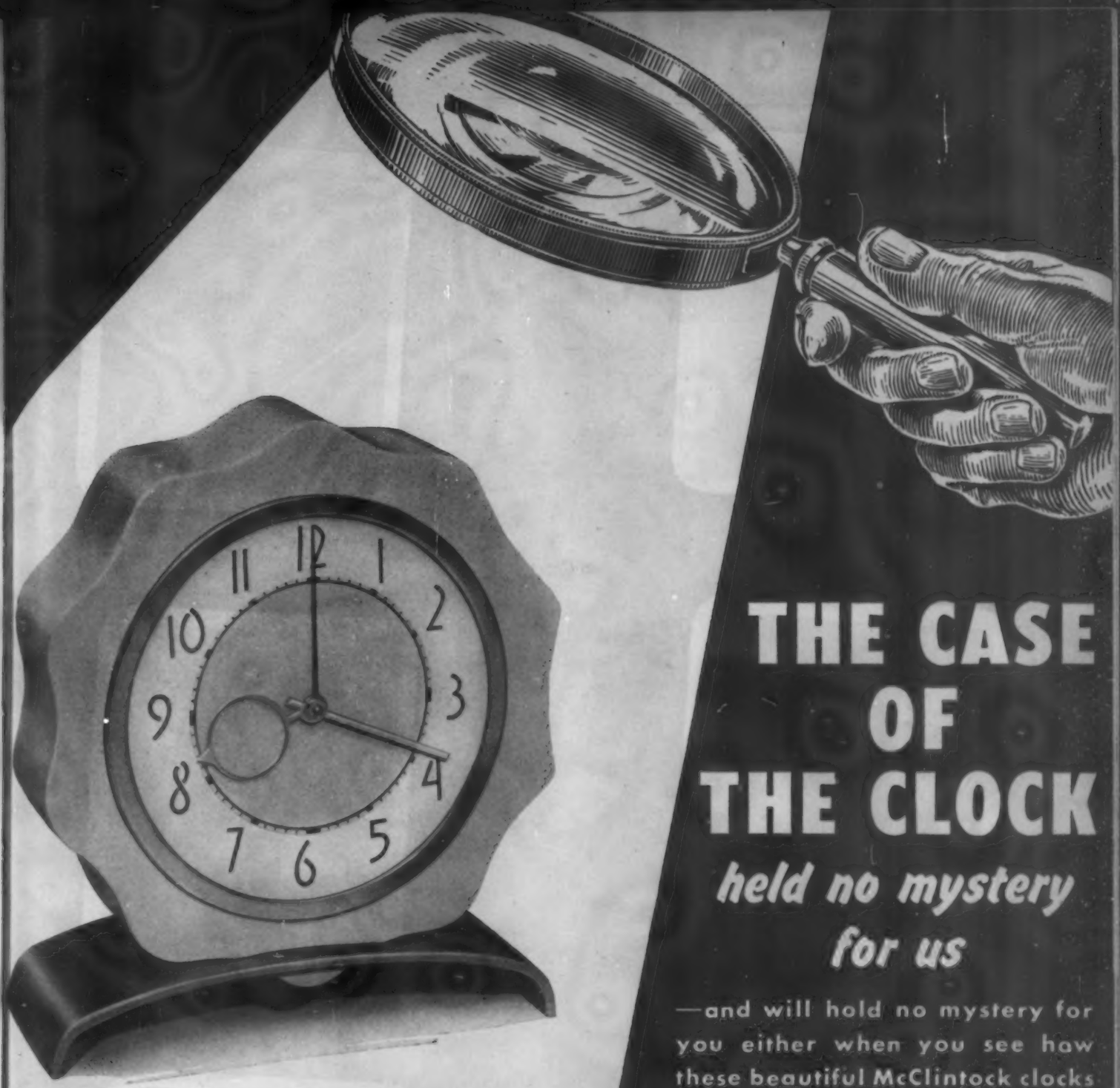
All-linen paper was once the pre-eminent material. Then wood pulp was tried — and found to last longer under heat and direct voltage. But why? Something in the wood was helping to preserve life. What was it?

Ultra-violet light, delicate micro-chemical analysis and hundreds of electrical tests gave a clue. Researchers followed it up—found the answer by treating the impregnated paper with anthraquinone—a dye intermediate. A mere pinch of the stuff prolongs capacitor life by many precious years.

When war came, great quantities of capacitors were needed for military equipment, where failures could cost lives, lose battles. The Western Electric Company, manufacturing for the Bell System, willingly disclosed the life-preserving treatment to other manufacturers. Today in communication capacitors, the new "life-extension" is helping to give more dependable telephone service.

Day by day, resources of this great industrial laboratory are being applied to perfect the thousands of components which make up the Bell System.

BELL TELEPHONE LABORATORIES *EXPLORING AND INVENTING, DEVISING AND PERFECTING FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE.*



THE CASE OF THE CLOCK

held no mystery for us

—and will hold no mystery for you either when you see how these beautiful McClintock clocks sell over the counter in their sparkling Creative housings. If your need is an elaborate housing, panel or just a knob or bushing, send your specifications to Creative for an analysis.

Plastics Specification Quiz: If it's not convenient for you to send blueprints or samples, write for our "Plastics Specification Quiz". Two minutes with this Quiz will enable you to tell us which of your products may be improved by the use of plastics.

Creative

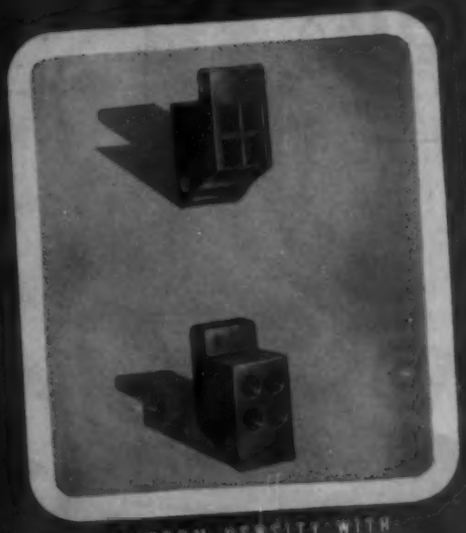
PLASTICS CORP.

Kent Avenue Brooklyn 5, N. Y.

PLASTICS - PACKAGING

ECONOMY THROUGH REDUCED FINISHING COSTS

ECONOMY THROUGH FASTER PRODUCTION



UNIFORM DENSITY WITH VARIABLE WALLS

DELICATE INSERTS

UNDISTORTED SIDE HOLES

the many advantages of TRANSFER MOLDING

TRANSFER MOLDING is the patented process which so efficiently molds the vast group of thermosetting plastics. In this process, the compound is subjected to heat and pressure in a chamber connected with the mold cavity. The compound flows into the mold cavity, which has previously been closed. "Curing" takes place in the mold, which is then opened for removal of parts.

Several technical bulletins, discussing all phases of the subject of Transfer molding, are available upon request.

For this literature, please write:

SHAW INSULATOR COMPANY

160 COIT STREET IRVINGTON 11, N. J.

A list of licensed Transfer molders near your own plant will be furnished upon request. Engineering help covering nearly all plastics materials and methods is available from Shaw and from the Plax Corporation, Hartford 5, Conn. The latter company has literature available on many new forms of thermoplastic materials.

SHAW

'R IRON HANDLES

IMPROVED APPEARANCE

LONG, ACCURATE RUNS

SHEET SLAB FILM

Cellulose Acetate
Cellulose Acetate Butyrate
Ethyl Cellulose • Polyethylene
Polystyrene

LAMINATED SHEETS

Polystyrene

BLOWN ITEMS

Cellulose Acetate
Cellulose Acetate Butyrate
Ethyl Cellulose • Polyethylene
Polystyrene

ROD

Cellulose Acetate
Cellulose Acetate Butyrate
Ethyl Cellulose • Methacrylate
Polyethylene • Polystyrene

SPECIAL SHAPES

Cellulose Acetate
Cellulose Acetate Butyrate
Ethyl Cellulose • Methacrylate
Polyethylene • Polystyrene

FIBER

Cellulose Acetate
Cellulose Acetate Butyrate
Ethyl Cellulose • Methacrylate
Polyethylene • Polystyrene

leading source of PLASTICS in many forms

THE MANY FORMS in which a wide variety of materials are available from Plax are indicated on these pages. Several of them are unique and original Plax developments.

Available literature includes an illustrated folder on "Extrusion Blowing of Thermoplastics"; "Plax Plastic Blown Products"; several "how to" bulletins on Plax polystyrene, including fabricating and polishing data; a bulletin on "New Special Plastic Shapes by Plax"; one showing new uses for Plax's flexible polystyrene sheet; and characteristics bulletins on most of the materials listed.

For any of this literature, please write:

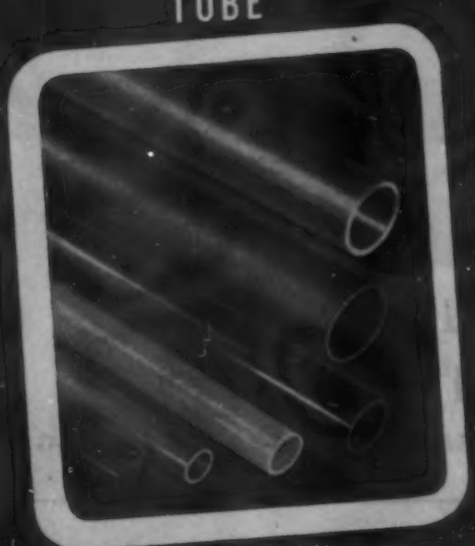
PLAX CORPORATION

133 WALNUT STREET • HARTFORD 5, CONNECTICUT

Engineering help covering nearly all plastics materials and methods is available from Plax and from the Shaw Insulator Company, Irvington 11, N.J. The latter company has literature available on many phases of Transfer molding.

PLAX
FOR PLASTICS
NOT SUBSTITUTES···IMPROVEMENTS

TUBE

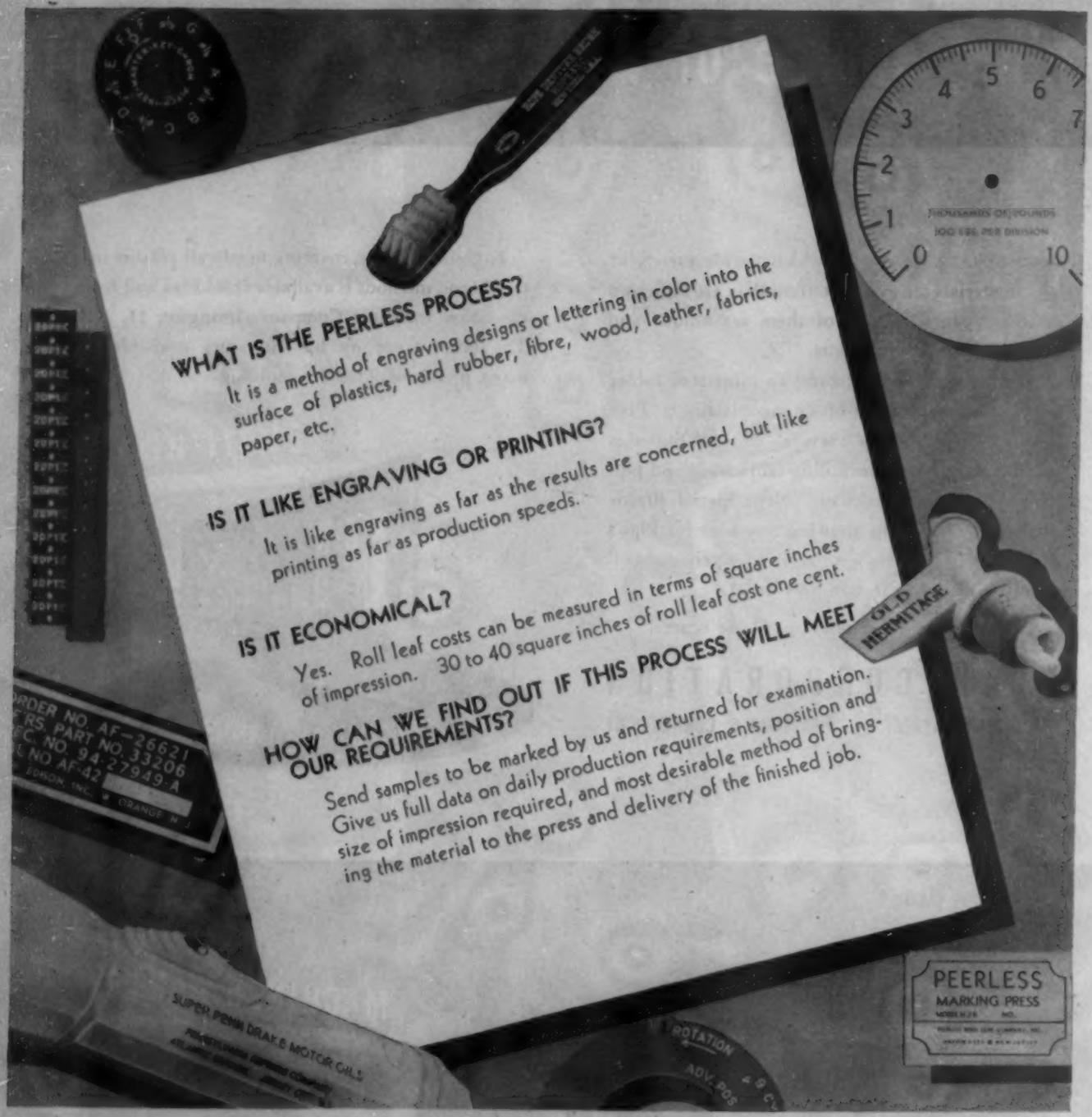


Cellulose Acetate
Cellulose Acetate Butyrate
Ethyl Cellulose • Methacrylate
Polyethylene • Polystyrene

MACHINED PARTS

Cellulose Acetate
Cellulose Acetate Butyrate
Ethyl Cellulose • Methacrylate
Polyethylene • Polystyrene

Q's and A's about The Peerless Process


WHAT IS THE PEERLESS PROCESS?
It is a method of engraving designs or lettering in color into the surface of plastics, hard rubber, fibre, wood, leather, fabrics, paper, etc.
IS IT LIKE ENGRAVING OR PRINTING?
It is like engraving as far as the results are concerned, but like printing as far as production speeds.
IS IT ECONOMICAL?
Yes. Roll leaf costs can be measured in terms of square inches of impression. 30 to 40 square inches of roll leaf cost one cent.
HOW CAN WE FIND OUT IF THIS PROCESS WILL MEET OUR REQUIREMENTS?
Send samples to be marked by us and returned for examination. Give us full data on daily production requirements, position and size of impression required, and most desirable method of bringing the material to the press and delivery of the finished job.
PEERLESS
MARKING PRESS

PEERLESS

ROLL LEAF COMPANY, INC.

MAIN OFFICE: UNION CITY, N. J. · BRANCH OFFICES: BOSTON · CHICAGO

Genuine Resproid Plastics

TRADE MARK

Unsupported Films
Coated Fabrics
Leather Substitutes
Extruded Rods, Tubes and Shapes

The name "RESPROID" stands for better plastic materials . . the result of years of experience in compounding synthetic resins, in many combinations, to produce a series of materials best suited for many specific uses.

Materials which variously combine high abrasive resistance . . toughness . . elasticity . . very high flex resistance . . resistance to weather, aging, sunlight, water. Materials which are highly chemically inert, resistant to acids, salts and alkalies, and insoluble in most solvents including greases and oils. Highly resistant to mildew and other fungous growths.

RESPRO INC.
CRANSTON 10 RHODE ISLAND

Visit the Resproid Display at
The National Plastics Exposition
April 22 - 27 Booths 8 and 9
Grand Central Palace, New York, N. Y.

Now Available—Colors That Glow

for these Applications	in these Plastics*	using these Pigments
Automotive and aviation dials and accessories; decorative effects; displays and advertising; light diffusion plates; radio dials and decorations; theatrical effects.	Polystyrene molding granules; acrylic sheets; cellulose acetate granules and sheets; urea and melamine formaldehyde molding powders and laminates; vinylite granules and sheets, rigid and flexible types—in all fluorescent colors from blue to red.	Horse Head** FLUORESCENT Pigments
Airplane emergency exit signs; apparel accessories; architectural trim; automotive accessories; clock dials; cord pulls; decorative effects; displays and fixtures; door knobs; electric switch plates; escutcheons and medallions; flashlights; fish lures; games; household articles; house numbers; jewelry; "juke" boxes; lamp parts; marking tapes; novelties and premiums; packages and labels; signs; slipper tips; toys.	Polystyrene molding granules; acrylic sheets; cellulose acetate granules and sheets; urea and melamine formaldehyde laminated sheets; urea formaldehyde powders; vinylite sheets—in all phosphorescent colors.	Horse Head** PHOSPHORESCENT Pigments

A phosphorescent flashlight is easy to find when needed most. It glows in the dark for hours after exposure to light (daylight or lamp light.) (Molded by Continental Can Co., using Monsanto "Lustron.")

HORSE HEAD** Fluorescent and Phosphorescent colors are opening up new plastics applications, adding extra sales values to others. Luminous plastic materials described above* are ready and proved for commercial application—to help designers create products that are easy to find in the dark, unusual color effects, safety aids, identity and non-counterfeiting features, light that is easy on the eyes, and color correction.

Our technical staff will welcome the opportunity to work with you, your molder or plastics supplier on any phase of luminous plastics applications.

Pin-up lamps have added sales appeal when the bracket is made of phosphorescent plastic, making it easy to locate in the dark. (Fabricated by Moglen Plastics; using duPont "Lucite.")

*The New Jersey Zinc Company does not manufacture plastics—we supply the Luminescent Pigments used by plastic manufacturers.

**Reg. U. S. Pat. Off.

HORSE HEAD PRODUCTS
New Jersey Zinc

THE NEW JERSEY ZINC CO., 160 Front Street, New York 7, N. Y.

Products Distributed by THE NEW JERSEY ZINC SALES COMPANY

NEW YORK • CHICAGO • BOSTON • CLEVELAND • SAN FRANCISCO

Send for test samples of

PANELYTE

close tolerance thin wall tubing

DESIGNERS, engineers and inspectors of various large radio manufacturers tell us that Panelyte thin wall tubing maintains superior electrical characteristics as well as diameter and concentricity tolerances.

We believe you will be interested in testing this tubing which enables the iron core slugs to perform much better . . . the tubing which does away with the headaches of rejected shipments.

Panelyte Grade 750, Paper Base (NEMA Grade X) rolled tubes with minimum wall thickness of .008" are available when O. D. is less than 5/16". Panelyte Grade 550, Paper Base (NEMA Grade XX) rolled tubes with minimum wall thickness of .016" are available when O. D. is less than 5/16", for use where humid conditions exist.

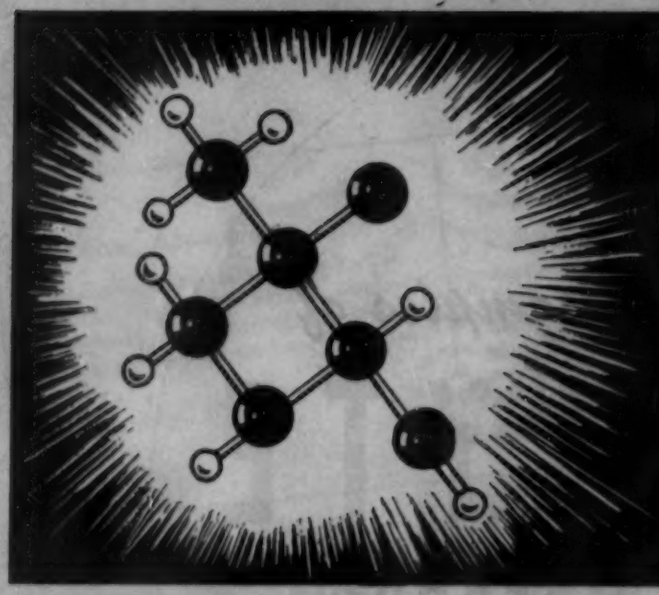
A request for samples on your company letterhead will receive immediate attention, and we will be happy to submit an estimate on your requirements . . . small or large. The Panelyte Data Book is available on request.

PANELYTE *the structural plastic*

PANELYTE DIVISION
ST. REGIS PAPER COMPANY
230 PARK AVENUE
NEW YORK 17, N. Y.

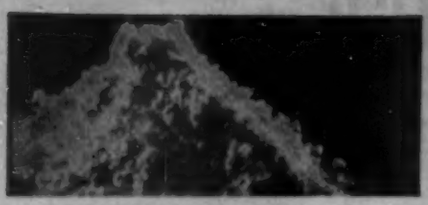
Sales Offices: Boston, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Kansas City, Lookout Mt., Tenn., Los Angeles, New Orleans, Phoenix, Portland, St. Louis, St. Paul, San Francisco, Seattle, Syracuse, Trenton: Buenos Aires, Johannesburg, Mexico City, Montreal, San Jose, Sao Paulo, Sydney, Toronto, Vancouver.

★ MASS PRODUCTION OF SHEETS, RODS, TUBES; MOLDED FORMS, FABRICATED PARTS IN PAPER, FABRIC, FIBRE GLASS, ASBESTOS BASE LAMINATES; DECORATIVE GRADES



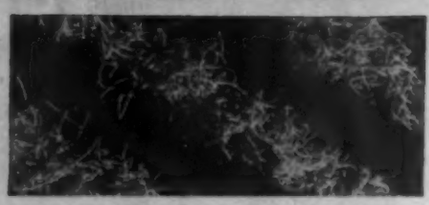
RAYCO FILLERS

Many Subdivisions Research-Fitted to YOUR needs



FILFLOC Pure cotton flock of surpassing cleanliness and uniformity.

FABRIFIL Macerated cotton fabric for extra strength.



CORDFIL Evenly cut lengths of tire cord; for plastics of utmost strength.

Commencing at the time of its pioneering efforts in 1932, Rayon Processing Co. has always made a special point of suiting its fillers to the molder's needs EXACTLY. The three basic Rayco cotton fillers are susceptible of infinite variations, as dictated by research we enter into jointly with the molder and compound manufacturer. Suiting fillers to needs EXACTLY has in some cases made improvements of as much as 30% with the same basic filler. Depend upon Rayco for the quality AND research, that assure maximum results!

SAMPLES GLADLY SENT

LOW-COST MOLDING COMPOUND

This macerated resin-impregnated fabric brings amazing economy to numerous items.

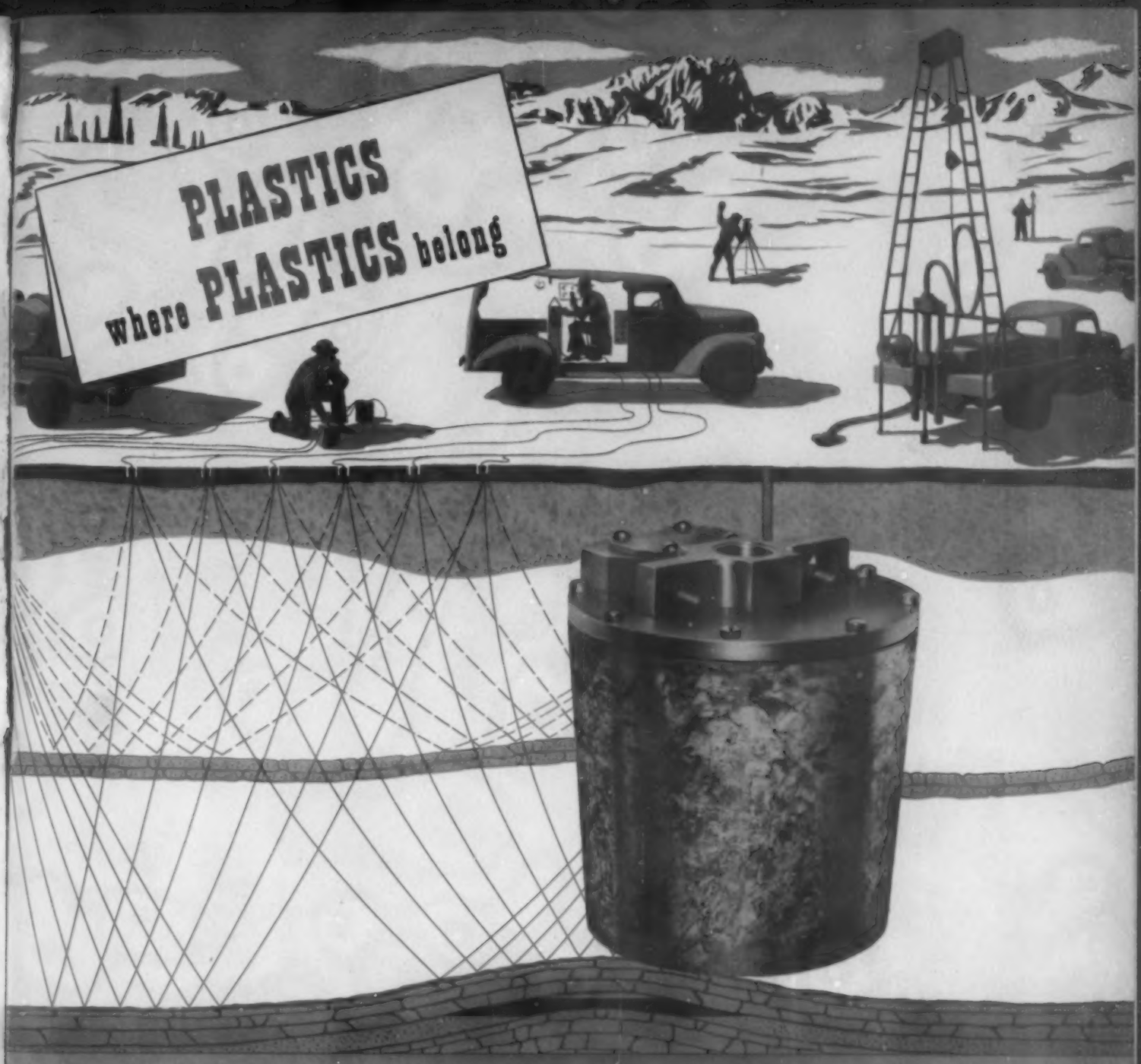
RAYCO

Fillers

RAYON PROCESSING CO. of R.I. INC.

Developers and Producers of Cotton Fillers for Plastics

60 Tremont St., Central Falls, R. I.



Using Corrosion Resistance, Ease of Machining

A NEW WAY to locate oil makes use of waves originating from a detonation of dynamite. Wave reflections are picked up by flower-pot-like "ears" strategically buried over the suspect area and seismographically recorded.

The pot or case, containing a sensitive electro-magnetic element, can be made of various materials. With Synthane, however, no special surface finish is required to resist corrosion. Synthane is also easily and quickly machined, and non-magnetic. In short, Synthane is *economically* better.

Is Synthane better for your job, too? Could be! Why not find out, preferably *before* you design? We're ready to help you with design, materials or completely fabricated parts.

SYNTHANE CORPORATION • 8 RIVER ROAD • OAKS • PENNSYLVANIA

SYNTHANE

SYNTHANE TECHNICAL PLASTICS • DESIGN • MATERIALS • FABRICATION

MAYBE IT'S TIME TO RECONVERT THINKING, TOO . .

By the time you read this, it's likely reconversion will be complete or nearly complete. *Plant* reconversion.

But before many a new product is born or an old product reborn, there will have to be a reconversion of thinking.

Some prewar notions about plastics and their limitations will have to be shelved, if they have not already been. Why? Because, even in the unspectacular technical plastics which we make, there have been important changes in resins and fillers. Low-loss and impact materials have been improved. Postforming of so-called thermosetting laminates is no longer a laboratory curiosity.

The old and erroneous habit of regarding plastics as ersatz materials has almost died out. Now it's the rule to use plastics where they rightfully belong, or not use them at all. As if to prove the point, there were so many legitimate uses for plastics during the war, plastics couldn't be spared for service as substitutes.

Reconvert your thinking about plastics? Yes! By all means go over every single part of your product or equipment to see where the advantages of plastics can be properly used to *your* advantage.

If plastics offer all the properties you want, or more than you want, at a more *economical* cost—considering labor, material, ease of manufacture, length of life, sales appeal, replacement expense, customer satisfaction—then use plastics.

Should our own type of plastics—Synthane—seem to answer your purpose, let us help you investigate the use, find the right grade of Synthane for the job, and—if you desire—fabricate the material for you.

The complete Synthane catalog is packed with helpful information. Before you forget, tear out the coupon and send for your copy now.

WRITE FOR IT TODAY

SYNTHANE

PLAN YOUR PRESENT AND FUTURE WITH SYNTHANE TECHNICAL PLASTICS • SHEETS • RODS • TUBES • FABRICATED PARTS • MOLDED-LAMINATED • MOLDED-MACERATED

SYNTHANE CORPORATION, 8 RIVER ROAD, OAKS, PA.

Gentlemen:
Please send me without obligation the complete catalog of Synthane technical plastics.

NAME _____

COMPANY _____

ADDRESS _____ ZONE _____ STATE _____

CITY _____

VERSATILE Velon* MAKES YOUR PRODUCT

• Look Better
• Wear Better

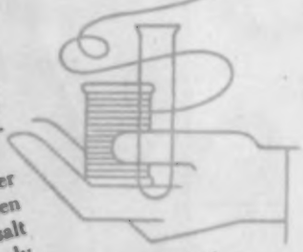
VELON YARN—The textile industry has found many forms and applications for Firestone's amazing new man-made yarn, *Velon*. As multifilament it can be given any texture, weave, pattern for almost any fabric application—handles and drapes beautifully. As monofilament *Velon* can be woven into upholstery fabrics for home, commercial and transportation seating, for shades, drapes, wall-trim, luggage, belts, hats, shoes.

VELON FABRIC—In any weave *Velon* makes lighter, brighter, smarter colors superbly practical. The non-porous threads resist dirt and grease; most chemicals can't stain it; sun or moisture won't alter the luxurious colors. *Velon* can be quick-cleaned with a damp cloth. It resists abrasive snagging or scuffing despite heavy wear; so resilient it keeps its shape and dimensions even as seat upholstery.

VELON FILM—This versatile plastic can actually be "tailor-made" to individual specification with greater economy than ordinary films. As coating or unsupported film *Velon's* applications range from protective packaging to rainwear, bags, artificial flowers, book cover stock, lampshades, outdoor furniture, cable covering. *Velon* can be endowed with almost any required thickness and tensile strength. It can have very high (or where desirable very low) tear resistance, be elastic or capable of great elongation with practically no recovery. It can be transparent, translucent, opaque, clear or colored. As packaging, *Velon* can be highly moisture-vapor resistant, or permit breathing. And Firestone's exclusive processes effect great economies for you.

VELON SCREENING—*Velon* will never rust, corrode, or cause ugly screen "bleed" stains. It is impervious to salt spray, sun, moisture. Although only one-fifth the weight of same gauge metal screencloth, *Velon* resists up to six times more impact without denting or bulging. The filament has a tensile strength of fifty-thousand pounds per square inch. And *Velon* screening can be tinted to blend with the interior and exterior color schemes—color harmony makes it less conspicuous, easier on the eyes.

Write Firestone, Akron, for full information on *Velon's* manifold applications. Firestone engineers and technicians will be glad to consult with you on your individual problems, to adapt *Velon* to your needs.



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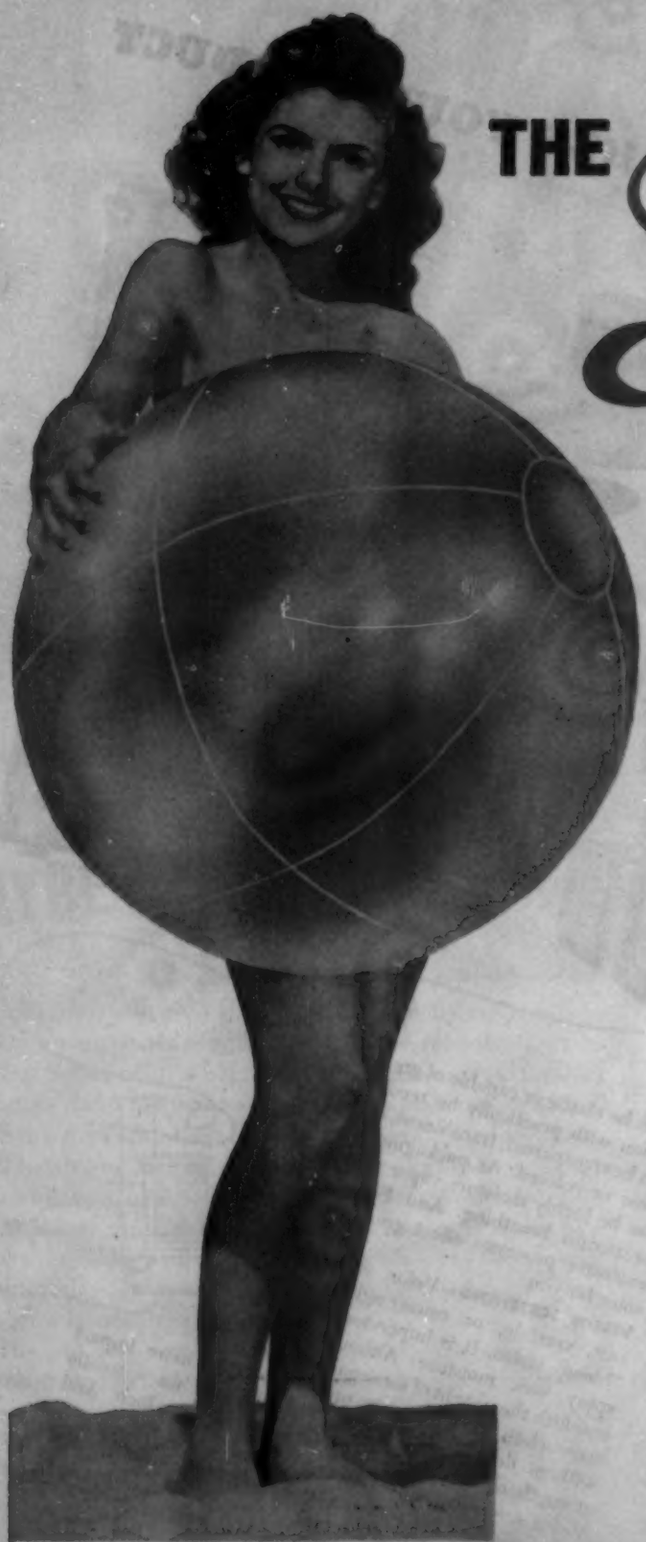
Firestone

BEST TODAY... STILL BETTER TOMORROW

*TRADE MARK



THE *Shape* OF THINGS TO COME . . .

Shoes to Shower Curtains

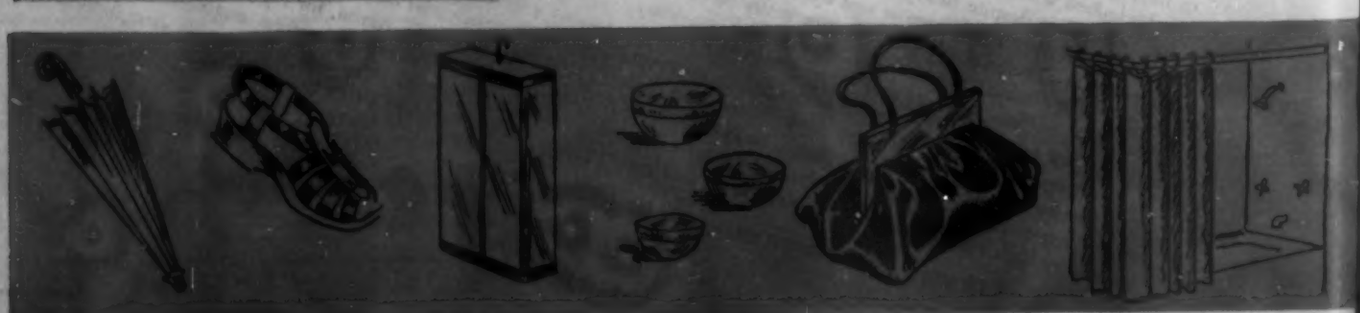
BONDING

Forward-looking fabricators in fields as diversified as shoes and shower curtains, giant plastic balls and handbags are using Thermatron electronic heating units to perform a great variety of intricate bonding jobs at a fraction of the time and cost of conventional methods.

Radio Receptor offers Thermatron models for every bonding, sealing and welding requirement.

Now, while you are planning new products and improved methods to meet the competition of the days ahead, is the time to get your copy of "Electronic Heat-Sealing of Thermoplastics."

Illustrated: giant plastic play ball currently seen in Life Magazine and newsreels — a product of Dupage Plastics Company—world's foremost users of electronic heat-sealing and largest users of the Thermatron. Production 1,000 balls a day.



..... BY Thermatron

Preforms to Plywood

MOLDING

Leading plastic molders agree on the superiority of dielectric electronic heating of preforms.

The Thermatron is a ruggedly constructed heat generator that embodies the following outstanding features: electrodes designed for your specific requirements . . . electrode cage at working level . . . automatic control . . . safety switches for protection of unskilled operators . . . mobile, compact units . . . complete overload protection . . . all parts accessible for inspection and maintenance . . . adjustable electrodes . . . fluorescent lighted work chamber . . . guaranteed components.

Visit our exhibit at the First National Plastics Show, Grand Central Palace, April 22 to 27 — booth 259.

Write for your copy of "Electronic Heating With the Thermatron."

Thermatron Division

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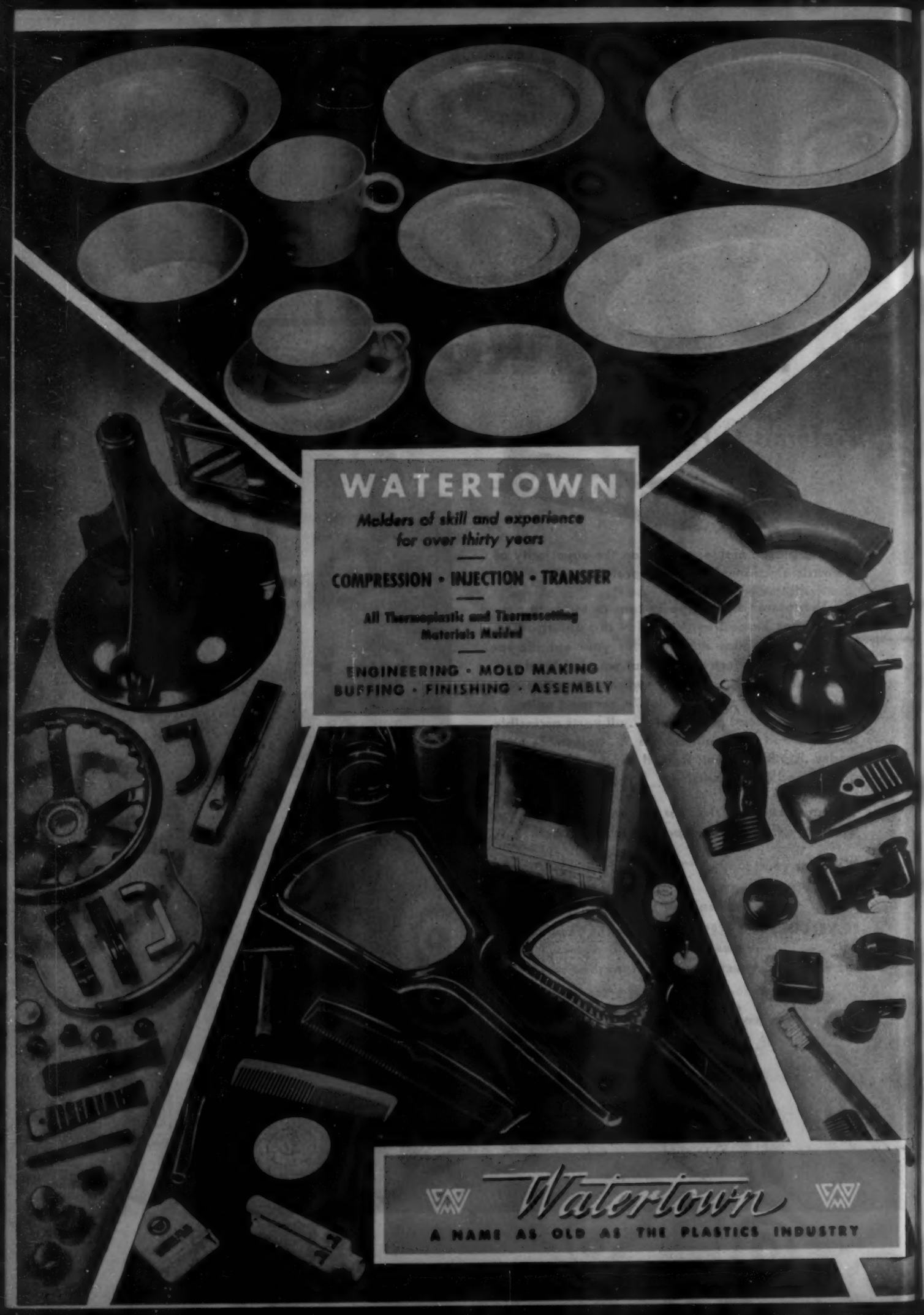
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A NAME AS OLD AS THE PLASTICS INDUSTRY

INDEPENDENT INVESTIGATOR FINDS

Sonotone uses Phillips Screws to reduce case breakage 90%

This investigator from James O. Peck Co., industrial research authorities, is visiting a number of representative plants to get authentic FACTS on assembly savings.

GET HIS FACT FILLED REPORTS ... GET THE COMPLETE STORY

Every driver skid eliminated saves $1.35 reclaiming costs!

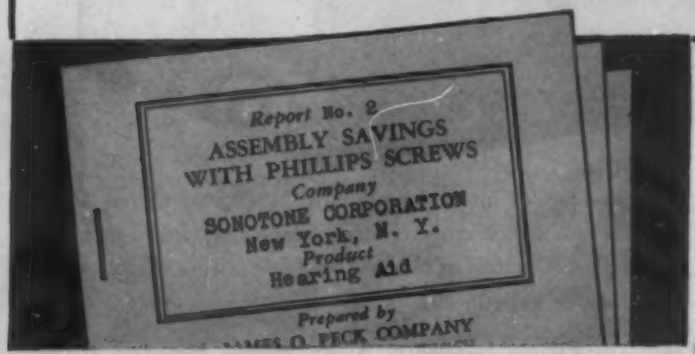
SONOTONE CORPORATION uses Phillips Screws because they lower costs and improve the product . . . the same simple but all-important reason why thousands of other successful manufacturers use them.

TO GET THE FACTS, to determine the actual savings, the investigator studied Sonotone's assembly methods, asked the same questions you would ask. He was told that, with slotted screws, breakage of the fine, hard plastic case of the Sonotone hearing aid would be ten times greater than with Phillips screws. Reclaiming, which involves not only the cost of a new case half, but also the cost of disassembly, reassembly and careful matching up of

case halves, amounted to $1.35 per unit. The burr-free, ornamental Phillips recess is another reason why Sonotone chose Phillips Screws. Read the complete, revealing story in the Sonotone report.

THE ASSEMBLY STUDIES cover all types of products – metal, plastics, wood – show how the many Phillips Screw advantages add up big savings you can make in your assemblies.

THE REPORTS now ready – and more to come – comprise a practical manual of modern assembly methods, never-before-printed information, inside facts you'd pay good money to get, – and it's yours, now, FREE!



PACKED WITH IDEAS FOR SAVINGS IN YOUR ASSEMBLIES!

Whatever you make you'll find how all assemblers licked problems like your own. Get these reports. The coupon will bring those ready now, and the rest as they are issued. Fill it in and mail it – TODAY!

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Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

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Central Screw Co.
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27 SOURCES

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Please send me the reports on Assembly Savings with Phillips Screws

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This Modern Universal Fatigue Testing Machine

gives you the right answers— right away

This Sonntag 2000-lb. Universal Fatigue Tester (±1000 lb. alternating force ±1000 lb. preload) is *a constant force type machine*, giving accurate information on the fatigue strength of various materials and components in direct stress, in bending, or in torsion. Fixtures, indicated above, accommodate a wide range of sizes. Silent, high-speed operation: no gears, cranks or cams. Work table seismically suspended. Ask for bulletin 207.

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THE BALDWIN GROUP

BALDWIN

SOUTHWARK

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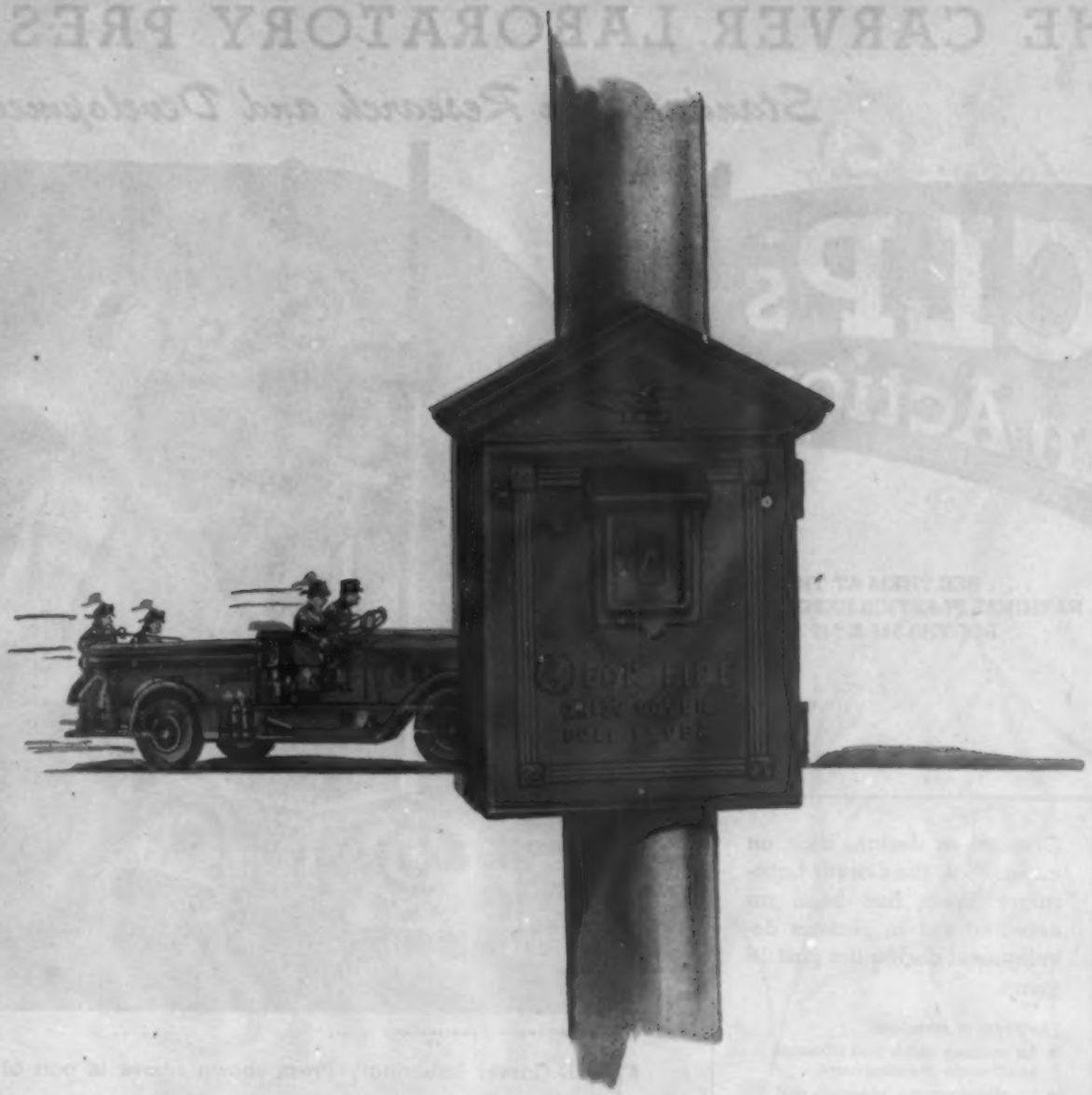

Color Gets Action

Nixon

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Plastics

Fire alarm boxes and fire engines are painted in bright red so you cannot miss seeing them. Color is one of the values you get when you use NIXON PLASTICS.

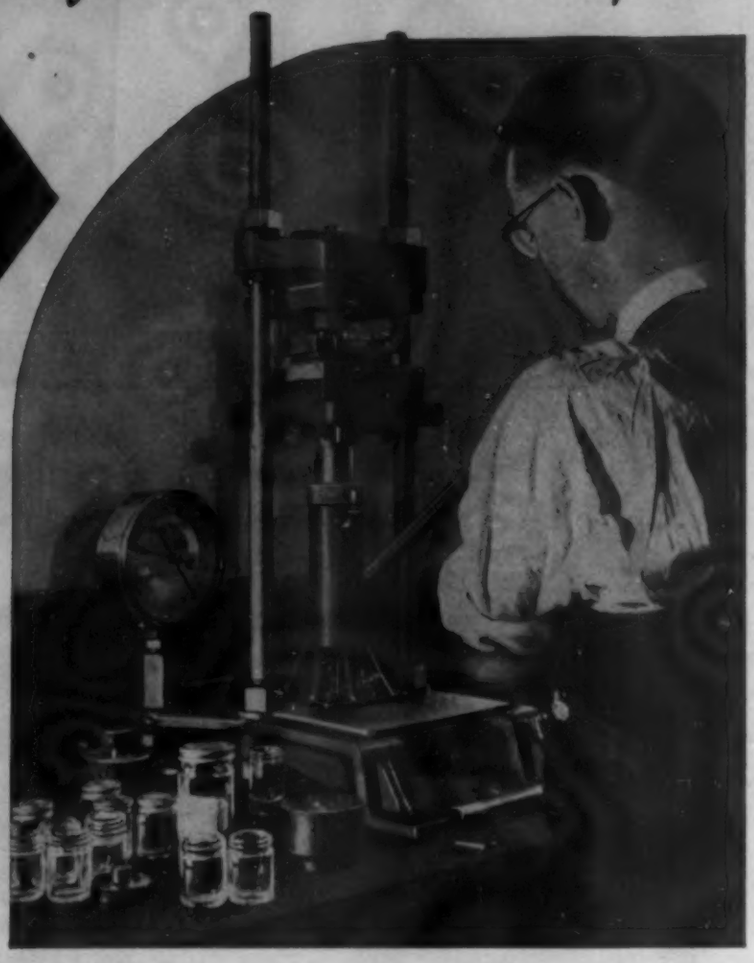
NIXON NITRATION WORKS

NIXON • NEW JERSEY

THE CARVER LABORATORY PRESS

Standard for Research and Development

CLP's in Action!



. . . SEE THEM AT THE
NATIONAL PLASTICS EXPOSITION
BOOTHS 344 & 345

Original in design, built on experience, the Carver Laboratory Press has been an essential aid in plastics development during the past 16 years.

The Press is standard

- for making quick and accurate small-scale pressing tests.
- for development, research and instruction work.
- for testing single cavity molds.
- for preparation of samples.
- and even for small-scale production.

The Carver Laboratory Press is small, compact,

- has a pressing capacity of 20,000 lbs.
- weighs only 125 lbs.
- operates under self-contained hydraulic unit, giving any precise variations in pressure that may be desired.
- large accurate gauge of finest construction is rigidly mounted on base.
- special gauges are available for low pressure work.

THE Carver Laboratory Press shown above is part of the equipment of the BELL TELEPHONE LABORATORIES, where it is used for pressing both plastics and ceramics in the extensive research work the Bell Laboratories are constantly carrying on.

This is one of hundreds of industrial applications to which the Carver Laboratory Press is being put in leading laboratories and plants all over the world.

The Press is available with electric or steam hot plates and test cylinders or molds. Also standard interchangeable accessories for general research—swivel bearing plates, cage and filtering equipment, etc. The press and certain of the accessories are patented. PROMPT DELIVERIES. Send now for latest catalog.

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Matching Bag

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These days, you find accessories made of PLEXON, *the Plastic coated yarn, wherever you go...on counters in smart stores, at gay resorts, any place chic women gather. For shoes ...bags...millinery...neckwear...all the name designers are using fabrics made of* PLEXON. *It is definitely taking the Fashion World by Storm!*

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for style harmony
Gleaming Black Trim
by GRIGOLEIT

AS an artist brings dead white to life with gleaming black strokes, the sparkle of Grigoleit black trims will enhance the beauty of your product ... harmonize with any color combination ... often add the final "stand-out" touch of luxury.

Many manufacturers use Grigoleit black handles, knobs and pendants on vital controls to make them easily distinguishable. These and other manufacturers have depended on Grigoleit for 19 years to furnish the newest, most beautiful trims for their products.

We offer a "standard" line of handles, knobs and other parts for stoves, furniture and appliances, plus a large variety of closures for foods, drugs and cosmetics.

We also maintain a complete custom-molding service in thermo-plastic and thermo-setting plastics. Our own metal and tool shops enable us to perfectly blend plastics and metal.

Write for our new 1946 Catalog

THE GRIGOLEIT COMPANY

DECATUR 80, ILLINOIS

Just what is the GORDON PLASTICATOR ?

Imagine two temperature-controlled cylinders or chambers, placed end to end, in which revolves a single spiral-threaded rotor. At one end there is an extruding head, provided with circuits for application of heating and cooling; at the other, an adjustable speed motor driving the rotor through reduction gears at the optimum speed for most efficient working of each plastic.

THAT IS THE GORDON PLASTICATOR.

Powders or granules fed into the hopper of the machine are densified and fused as they are pushed forward by a powerful forcing thread. They are then acted upon by the plasticating section of the rotor, and all the ingredients are blended to make a homogeneous whole. For some plastics a further mixing and blending is required and this is accomplished either by a "torpedo" or a fluted cone and head. The design depends upon the types of plastics to be handled.

Passage through the machine will neither contaminate the product nor spoil delicate colors. All parts of the Plasticator which are in contact with the ingredients are made of materials extremely resistant to corrosion and abrasion.

Write to us for details of how this unique machine can serve you. Our engineers will be glad to work with you on your processing problems.

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- Banbury Internal Mixers
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- Converting, Mixing and Sheeting Rolls
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FB-275

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Heats 6 Pounds (96 ozs.) in ONE MINUTE

the THERMALL CHAMP

The THERMALL *Champ* has every feature the plastics molder needs. Compact size 20 x 30 inches. Complete portability. Capacity to handle big jobs. Low operating cost. Steady, day-in-day-out performance. Built in safety — electrical and mechanical. No maintenance problem.

The THERMALL *Champ* is engineered for *simplicity, ruggedness* and *heavy duty*. Like all THERMALL Units, the *Champ* is unconditionally guaranteed. Under the THERMALL plan you are further protected against obsolescence and benefit from every new engineering development in THERMALL Units.

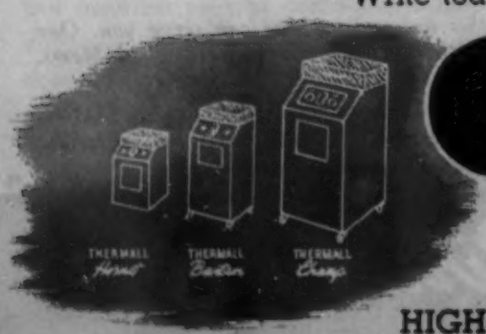
You owe it to your profitable operation to arrange *now* to try the THERMALL *Champ* in your own plant — without obligation.

Write today to:

Occupies only 20 x 30 inches of your floor space.

Completely portable — Weighs only 500 lbs. Mounted on Rubber Casters. Easily rolled from job to job.

Exclusive, THERMALL *one control* operation.



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DOOR chimes are fast becoming standard equipment in new homes and apartments everywhere. As such, they must present a smart, attractive appearance . . . reflecting the high standard and excellent taste of today's architect.

The plastic door chimes housing illustrated is custom molded—by Norton—to meet the strict design requirements of one of the largest manufacturers in this field.

For years, Norton's experienced design engineers have been working hand in hand with progressive, plastic-minded manufacturers representing practically all fields of industry . . . manufacturers who have been quick to recognize the unusual merchandising value of plastics—prudently used.

Combine this rich background with the extensive facilities for compression and injection molding which are available at Norton, and you can readily understand why leading producers of cosmetics, electrical appliances, automotive accessories and a myriad other items—all look to Norton for their custom molding.

Unfortunately, the current shortage of plastic materials of all types is very serious. Naturally, this limits our operations considerably. However, the future looks bright and we are sure you will agree that *now* is the time to plan for it. Norton Laboratories, Inc., Lockport, N. Y. *Sales Offices: 347 Fifth Ave., New York City—9 South Clinton St., Chicago.*

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Quality – Variety and Economy

in

THERMOPLASTIC

MOLDINGS

with every Facility for Volume

●

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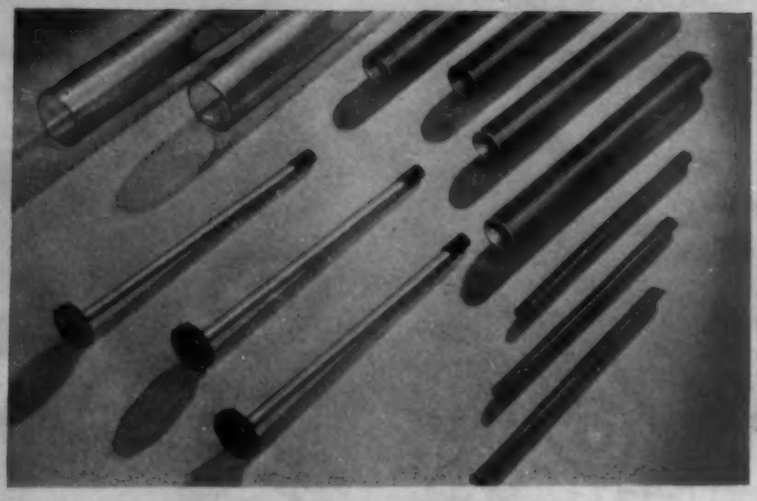
Here, at CELLUPLASTIC, proper design of the mold, and skillful technique in providing correct formulas, as well as rigid production and inspection procedure *assures* Quality. The variety of molded products we make, and the modern methods of operation provides ample evidence of knowing how to produce *economically*.

We've worked with many *types* of products. Simple or intricate, you may be sure we will amply repay your confidence with well established integrity. Facilities for volume production on moldings up to 16 ounces.



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Here too, CELLUPLASTIC assures accurate dimensional tolerances, in the finish, color and flexibility desired. Continuous lengths, flexible or rigid, produced under critical supervision.

RODS, TUBING, TAPES and Special Shapes, made to your specifications.

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Standard MULTIPRESS accessories include benches, side shelves, extension tables, a variety of bolster plates, straightening fixtures, indexing tables, automatic cycling controls, and the revolutionary new Vibratory Ram Action. The latter provides short, uniform, closely regulative strokes at frequencies up to 500 per minute!

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ASSEMBLING

PLANE *talk about* PENACOLITE

the resorcin resin adhesive

Bellanca Aircraft Corporation's adhesive choice for use in production of its trim four-passenger family plane, the new 1946 Cruisair Senior, is PENACOLITE—the resorcin resin adhesive. Its internally-braced full cantilever wing features modern all-wood assembly—wood laminated and assembled with PENACOLITE—and is pound for pound stronger than metal.

Chances are that your operation does not need all the rigid specifications exacted of PENACOLITE by Bellanca's engineering and research departments: strength not less than 3500 psi; permanently boilproof, waterproof, weatherproof; resistant to molds, fungi, acids, and organic solvents. But you'll appreciate the extreme ease of PENACOLITE's spread-on application . . . and the rapid cures at reduced temperatures.

For information regarding applications of PENACOLITE adhesives write Pennsylvania Coal Products Company. Details covering intended uses, types of materials to be treated, and production methods of temperature and pressure will enable us to suggest the PENACOLITE best suited for your purposes.

Photographs of the Cruisair Senior taken in midair by Hans Greenhoff

Write Department B-3

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PETROLIA, PENNSYLVANIA

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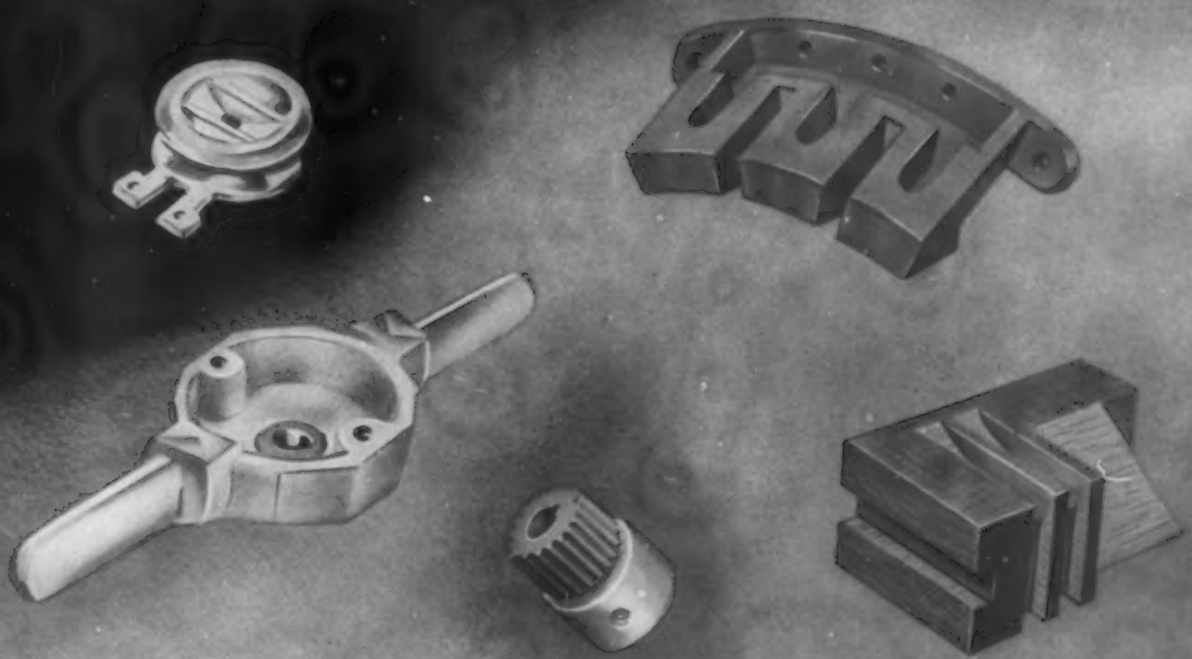

Fine workmanship, coupled with a thorough knowledge of all plastic materials and processes, is reflected in Brilhart made products . . . We are proud of the things we make!

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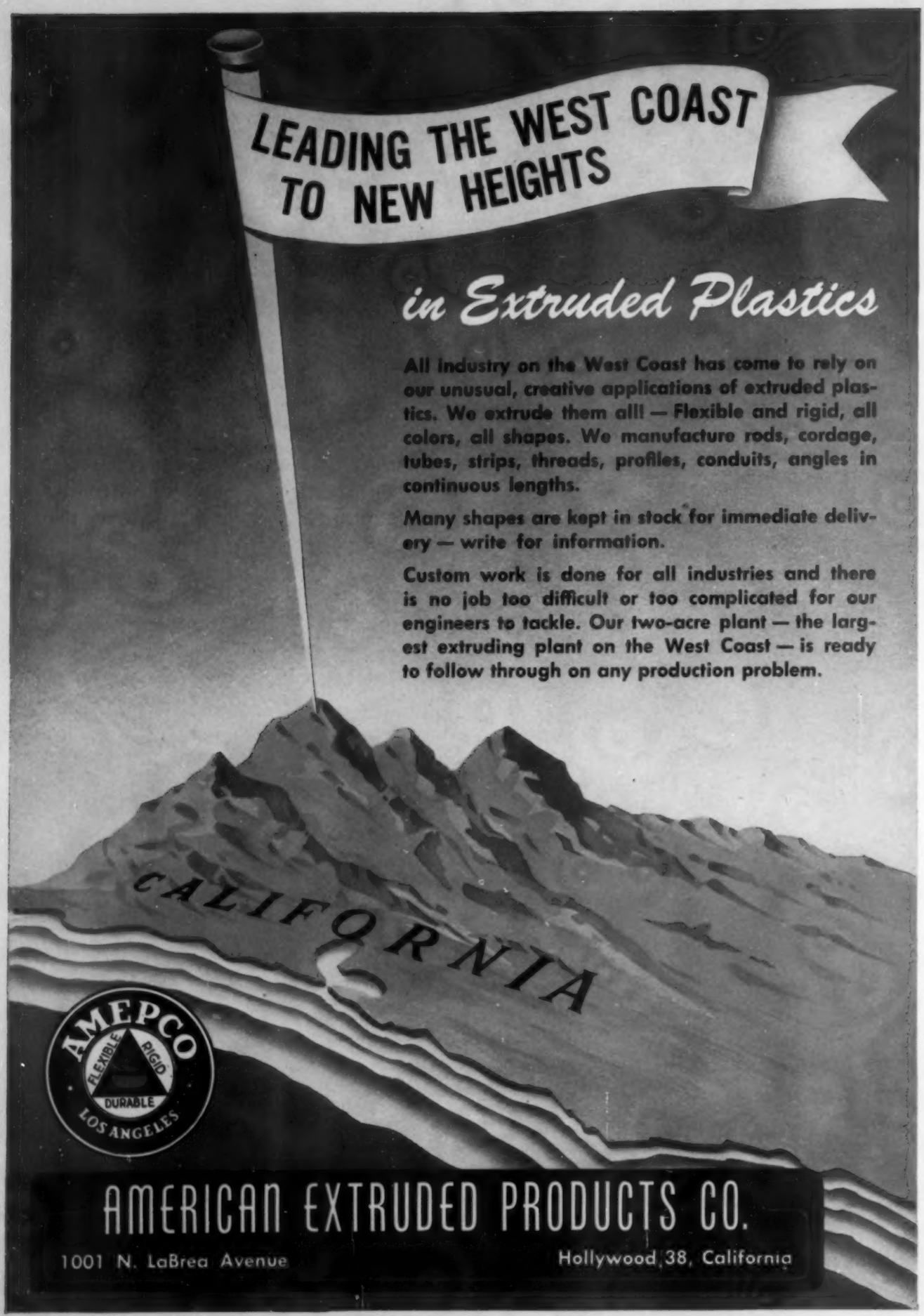
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All industry on the West Coast has come to rely on our unusual, creative applications of extruded plastics. We extrude them all! — Flexible and rigid, all colors, all shapes. We manufacture rods, cordage, tubes, strips, threads, profiles, conduits, angles in continuous lengths.
Many shapes are kept in stock for immediate delivery — write for information.
Custom work is done for all industries and there is no job too difficult or too complicated for our engineers to tackle. Our two-acre plant — the largest extruding plant on the West Coast — is ready to follow through on any production problem.
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Long experience in manufacturing closures, combined with vast research in the plastic development field, make us *specialists* in producing a great variety of small, thermo-setting parts and items in large volume with dependable efficiency and corresponding economy.

We will be happy to consult you about your particular plastic needs.

LOOK FOR THE DIAMOND

PLASTIC DIVISION

OWENS-ILLINOIS GLASS COMPANY

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In plastic molding

PROPER MOLD MAKING

assures beauty more than surface deep!

Mack MOLDED EXCELLENCE

Poor surface is only one of the major troubles which may ruin an otherwise perfect molding job. These "quirks" are many—ranging from pitting and blisters, to sticking and warping...are brought about by a multitude of conditions.

Microscopic scrutiny would reveal such imperfections penetrating far below the surface or finish, delving into the body of the structure itself. That's why experience goes a long way in plastic molding to obtain proper results . . . with mold making tending toward craftsmanship, rather than a mere mechanical phase.

WRITE FOR THIS INFORMATIVE BROCHURE

MACK MOLDING—With a background of some twenty-six years in serving industry—offers complete collaboration from design and blueprint inception, right through to final delivery. For a better, closer customer-molder understanding of plastic molding and the problems involved, an eight-page booklet is available on request. A general, non-technical treatise, this literature offers helpful hints and possibilities for plastics in your scheme of things. A note on your letterhead will bring your copy promptly.

MACK MOLDING CO., INC.

120 MAIN STREET, WAYNE, NEW JERSEY

SALES OFFICES: NEW YORK, CHICAGO, DETROIT, INDIANAPOLIS, BOSTON, AND ST. LOUIS

ARE YOU AWAKE TO THE UNIQUE

Flexmir METALLIZING PROCESSES?

Excuse us if we give you just a little nudge. We merely want to open your eyes to the possibilities in the FLEXMIR method of metallizing non-conductive materials. For FLEXMIR, Inc., is the pioneer in creating metallic finishes with a brilliance, reflectivity and beauty never before attained.

Our plastic unbreakable mirror is a good example. First developed in our research laboratories, it is practical in application and stunning in eye-appeal. Made in the exclusive FLEXMIR way, it is durable and permanent . . . shows no deterioration with age, and has a mirror quality that is beyond compare.

It can be made to any thickness; cut to any size or shape . . . in silver or in any brilliant color shade. And its uses are as wide as your own imagination. Truly . . . the FLEXMIR process reflects the ingenuity of Tomorrow's Plastic Age!

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PLASTIC MIRRORS
(for Cosmetic Items)

COLORED METALLIC SEQUINS

FLASH SPRAY ITEMS

METALLIZED BUTTONS AND NOVELTIES
(in gold, silver and antique)

METALLIZED BOTTLES AND TOPS
(in gold and silver)

The illustrations shown are just a few of the items produced by the FLEXMIR processes. Others include reflectors, toilet sets, curio shelves, picture frames, beads, costume jewelry, colored metallized acetate sheets and rolls, surgical mirrors and plastic mirrors for the cosmetic, building and automotive industries.

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AFFILIATED COMPANIES: PLASTICS FINISHING CO., INC., METALLIC PLASTICS CO., INC.
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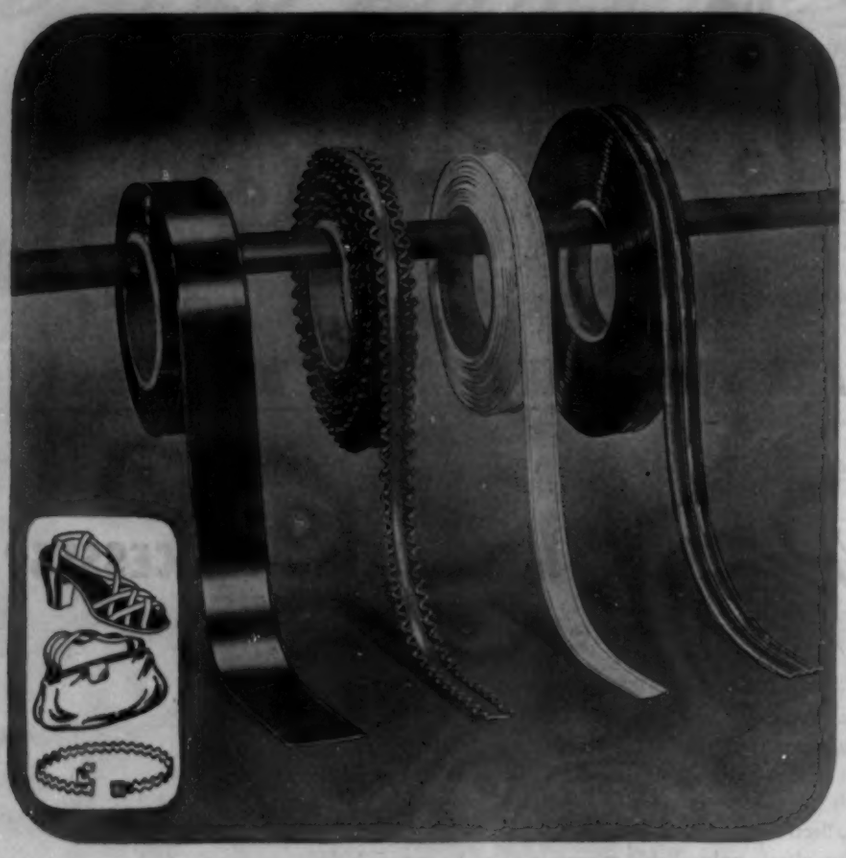

EXTRUDED VINYLS

Any Shape, Width or Color

We extrude them in flat or paneled strips or in novelty designs, in all widths up to 4". Extruded tubes up to 1" diameter. Seven colors as well as clear.

Ask for samples. See for yourself the superior finish we impart to these long-wearing, economical materials that have such a wide variety of uses.

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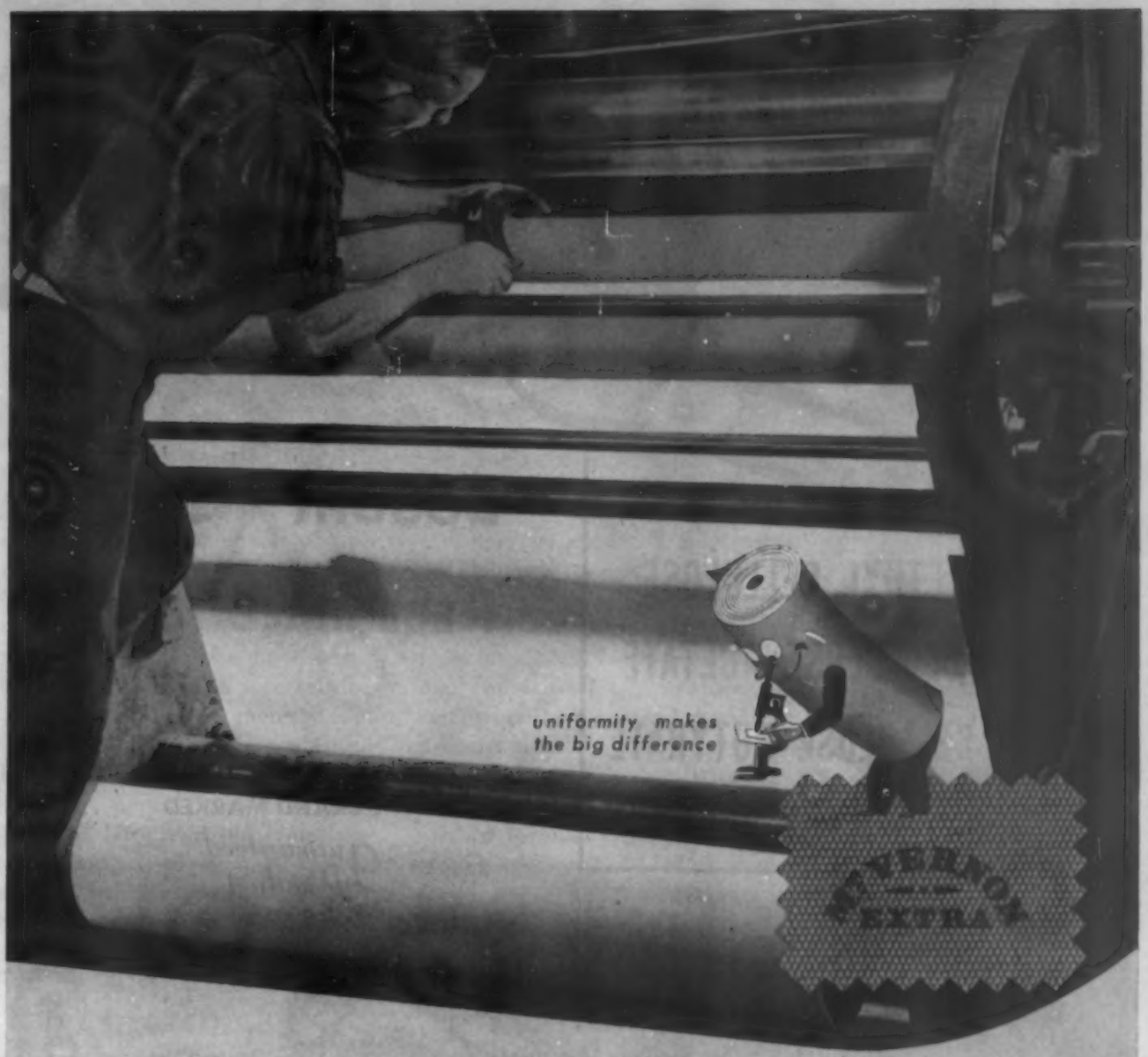

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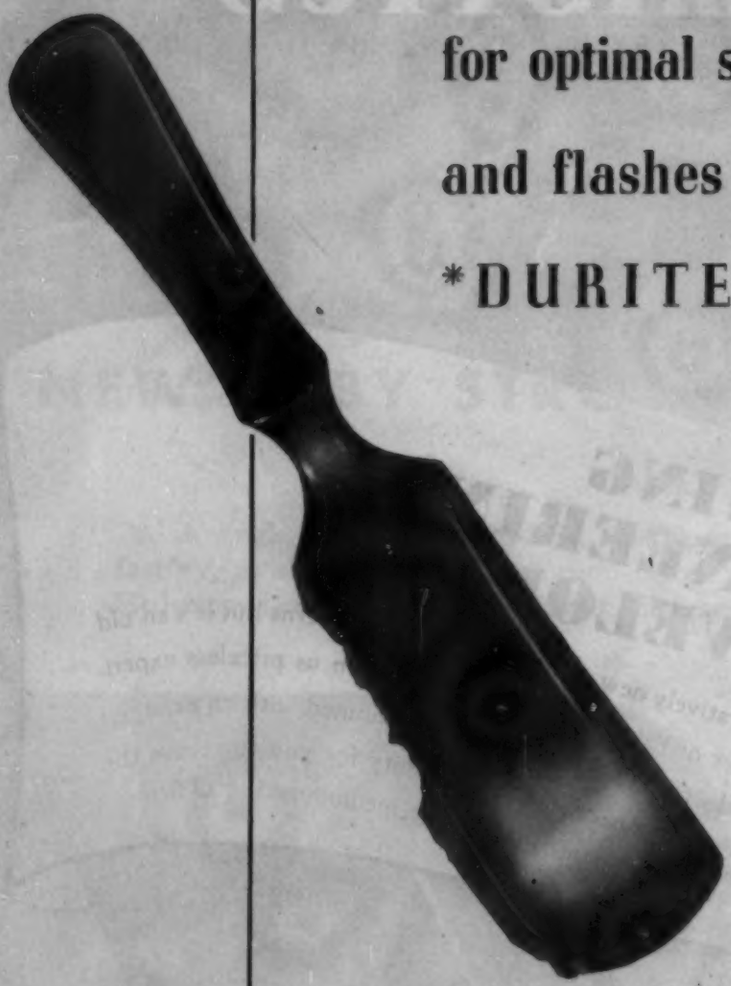

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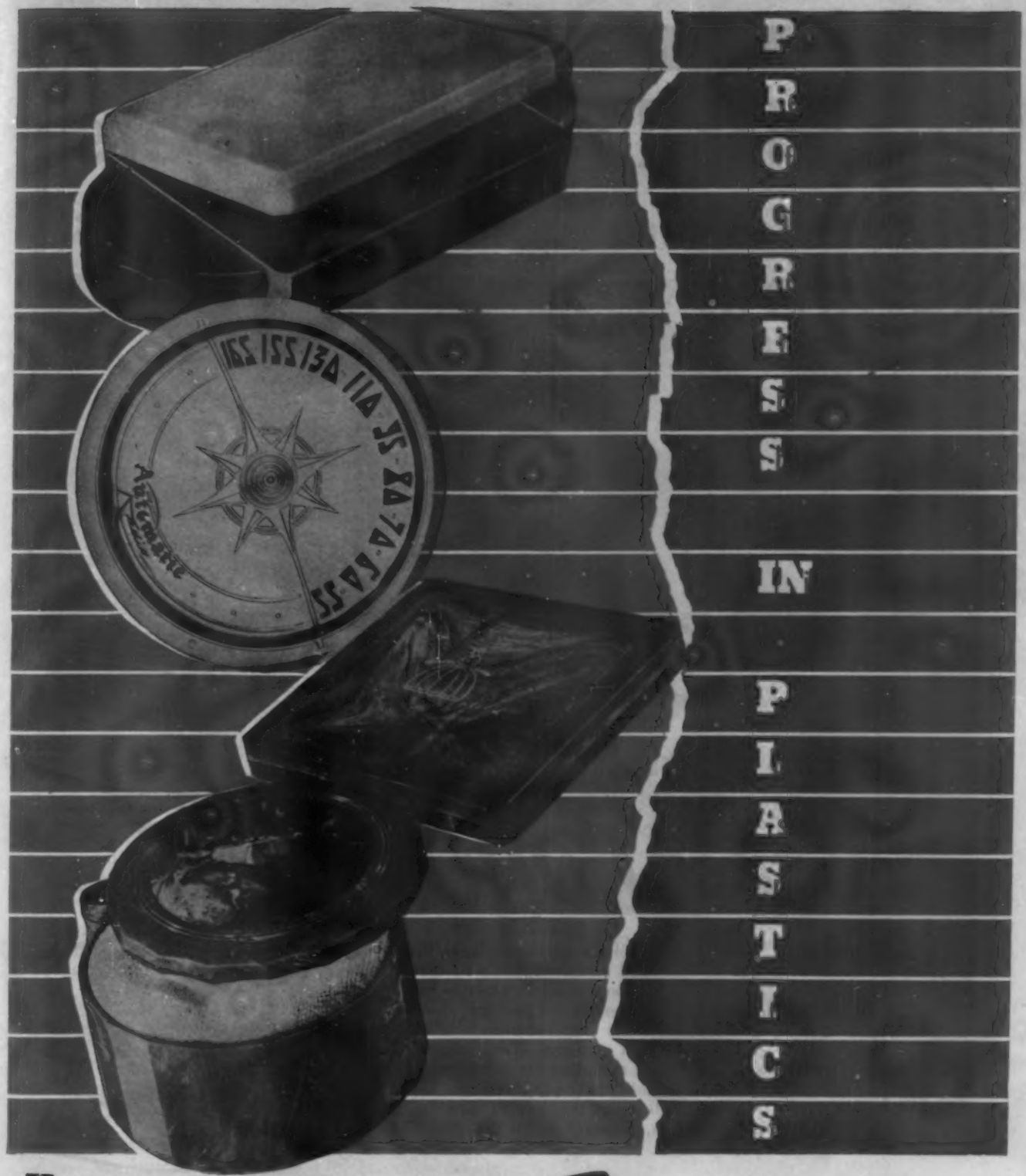

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Reduced reproduction of article published in May issue of Plastics magazine

Waldron Treater System

and the machines that make them possible are built by

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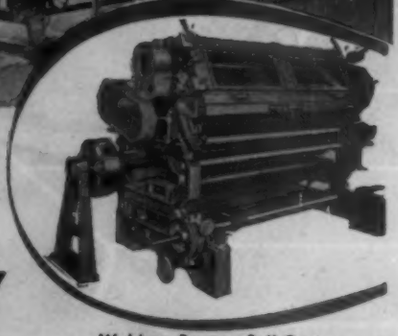
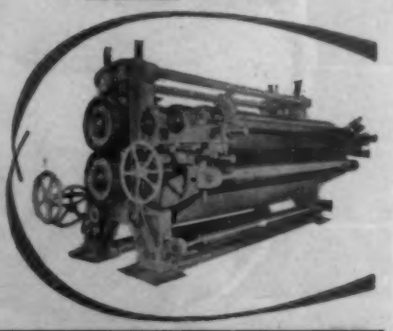


Waldron Reverse Roll Coater for applying plastics solution

Waldron Treater Head equipped with reverse roll coating mechanism



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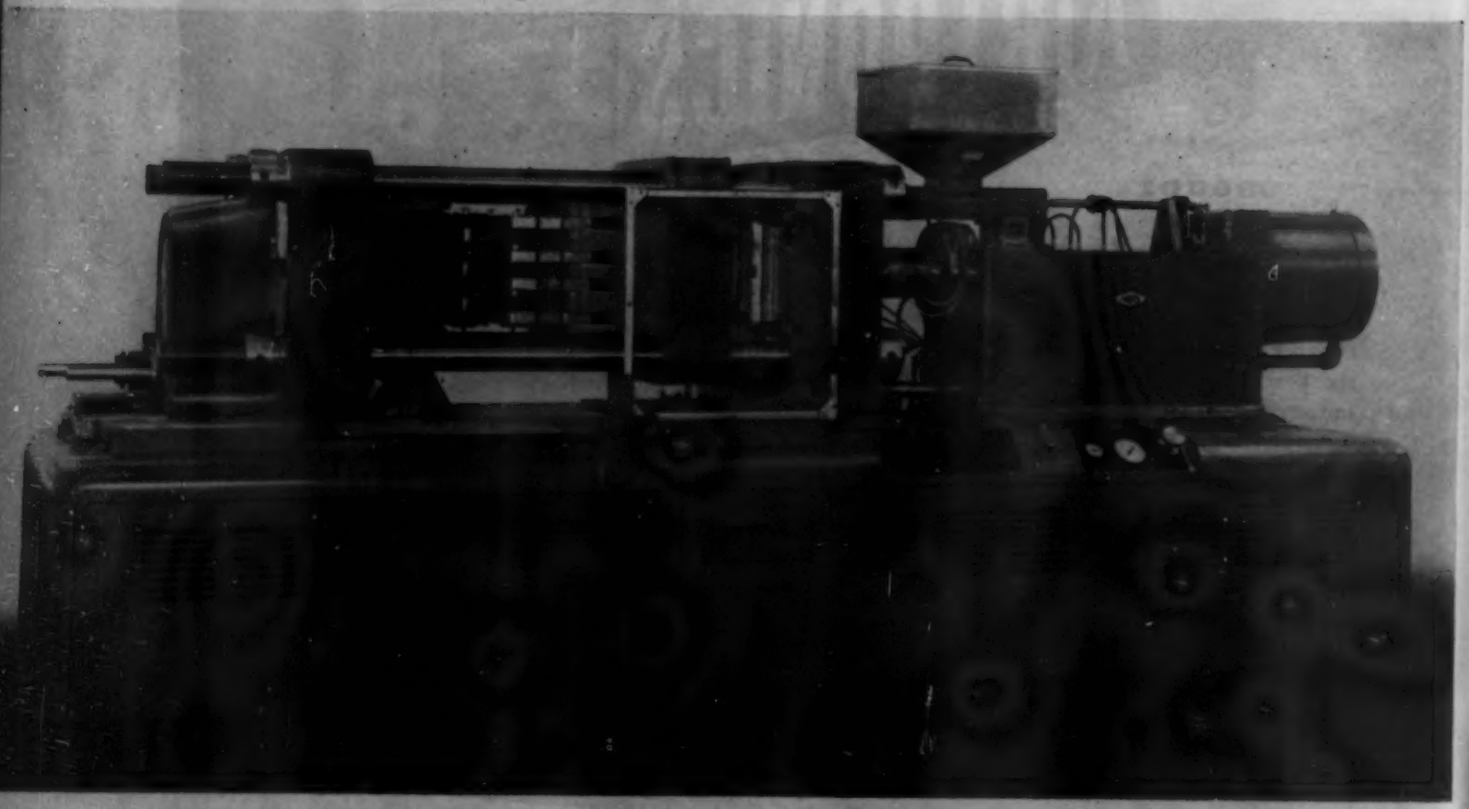

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4) Its one-piece welded steel base gives extra strength to the entire machine.
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Meanwhile, we are anxious to deliver fairly large samples of the several products of this plant and to work with you in your development program.

SOME TYPICAL SPECIFICATIONS AND USES OF EMERY'S PLASTOLEIN PRODUCTS

L-110*—Azelaic Acid $C_7H_{14}(COOH)_2$
Combining Weight.....93-97
Acid Value.....575-600
Melting Point.....96° C
Solubility.....Slight in cold water, infinite in hot water. Soluble in alcohol, ether and polar solvents.

X-55 —Molecular weight.....362 (average)
Average Boiling Point.....232° C
Hydrolysis (Boiling water—2 hrs.).....0.6
Excellent for use with vinyls imparting good low-temperature flexibility, coupled with good ageing characteristics.
Typical uses: shoe soles, bed cribbing.

X-348 —a low cost primary plasticizer with excellent ageing characteristics—proved by the retention of over 60% of the initial ULTIMATE elongation after 70 hours at 250° F.

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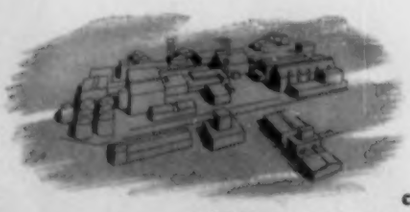

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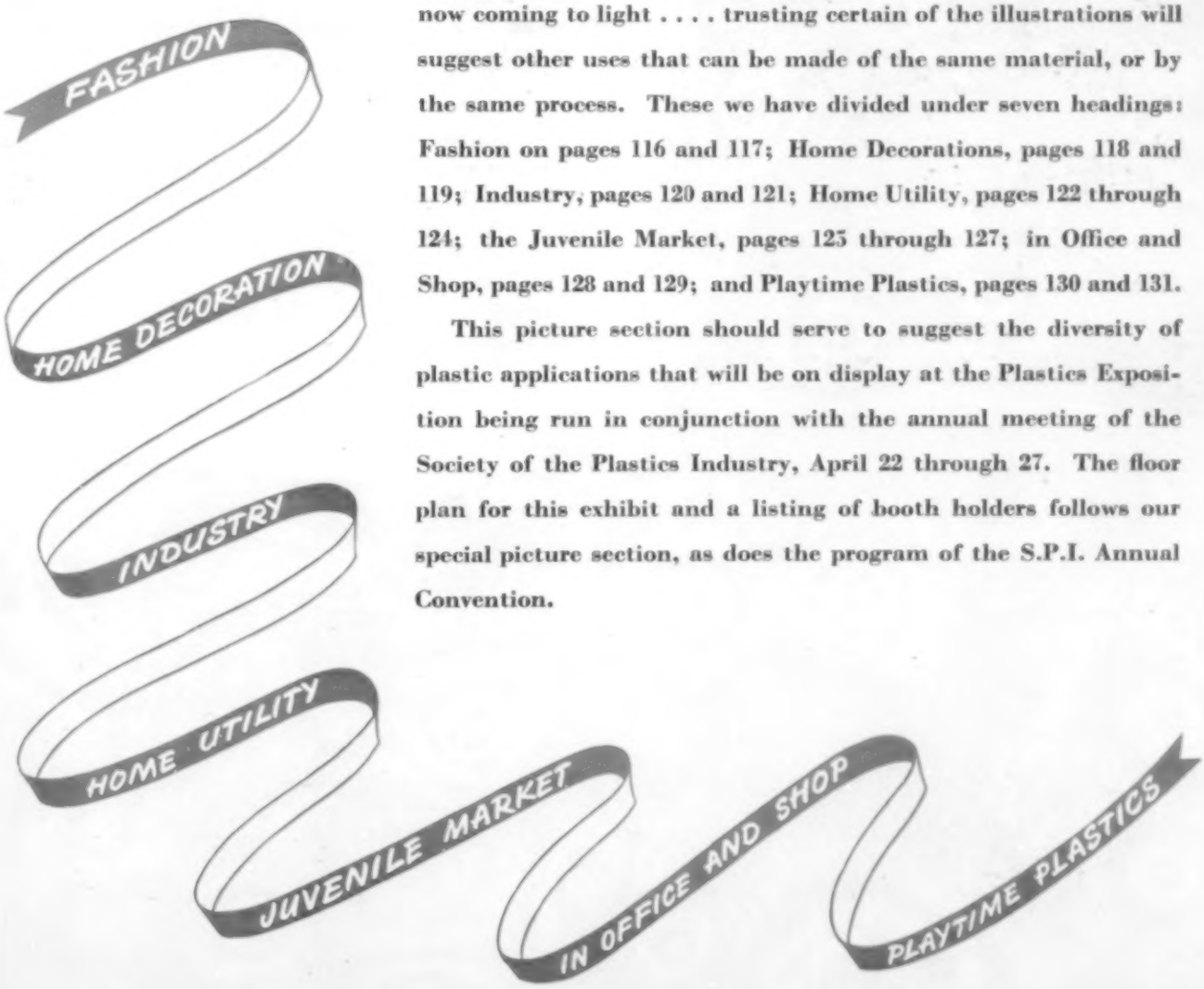
MODERN PLASTICS
VOLUME 23 APRIL 1946 NUMBER 8

Sampling the Markets

WITH its diversity of materials, and countless variations thereof, and with its different methods of processing, the plastics industry has made a place for itself in almost every line of endeavor. The day is past when a picture section, such as we present on the following 16 pages, can give the complete story of plastics. A *sampling of the markets* is the most that can be achieved.

And this is what we have done in the pages that follow—intermingling the old familiar applications with those that are only now coming to light . . . . trusting certain of the illustrations will suggest other uses that can be made of the same material, or by the same process. These we have divided under seven headings: Fashion on pages 116 and 117; Home Decorations, pages 118 and 119; Industry, pages 120 and 121; Home Utility, pages 122 through 124; the Juvenile Market, pages 125 through 127; in Office and Shop, pages 128 and 129; and Playtime Plastics, pages 130 and 131.

This picture section should serve to suggest the diversity of plastic applications that will be on display at the Plastics Exposition being run in conjunction with the annual meeting of the Society of the Plastics Industry, April 22 through 27. The floor plan for this exhibit and a listing of booth holders follows our special picture section, as does the program of the S.P.I. Annual Convention.



Fashion

1

1 Dresses may be the mainstay of fashion, but hats and purses are the elements that give it variety and zest. Little wonder then that designers have seized upon plastics, with its variety of colors and textures, as the material from which to make these accessories. This mammoth draped beret, for which Rose Saphire chose fine multicolored woven Plexon, shows how wise is this selection and how well it makes up

2 Not to be outdone by other fashion designers, shoe stylists are making increasing use of plastic materials in their newer footwear. While soles represent the greatest outlet for vinyl resins in the shoe field, a certain quantity goes into uppers as in the case of these two pairs of pumps which make use of Pantascote Pantex. In addition, plastics are enjoying a boom as shoe buckles and trim and will again be used widely as a covering for heels where their scuff-proof and soil-resistant qualities stand them in good stead

3 Judging by the frequency with which plastic patent is featured in newspaper and fashion magazine advertising, this material has taken firm hold on the style field, not only for shoes but for handbags as well. Monsanto Chemical Company's black patent vinyl butyral film, calendered on a cloth backing, makes up the body of this particular purse, designed by Josef and produced by Rex Products Corporation

2

3

4 Transparent vinyl film, opaque vinyl film, clear film, colored film—it's almost attained the status of an old standby in the rainwear field. And we can expect innumerable off-shoots of this application—this Elasti-Glass golf jacket, for instance, which is fashioned from Bakelite's unsupported vinyl film. With the seams and edges secured either by electronic sealing or by the cemented heat sealing method, these jackets, which are produced and merchandised by S. Buchsbaum & Co., should prove popular because of their resistance not only to water but to grease, heat and cold, and mildew

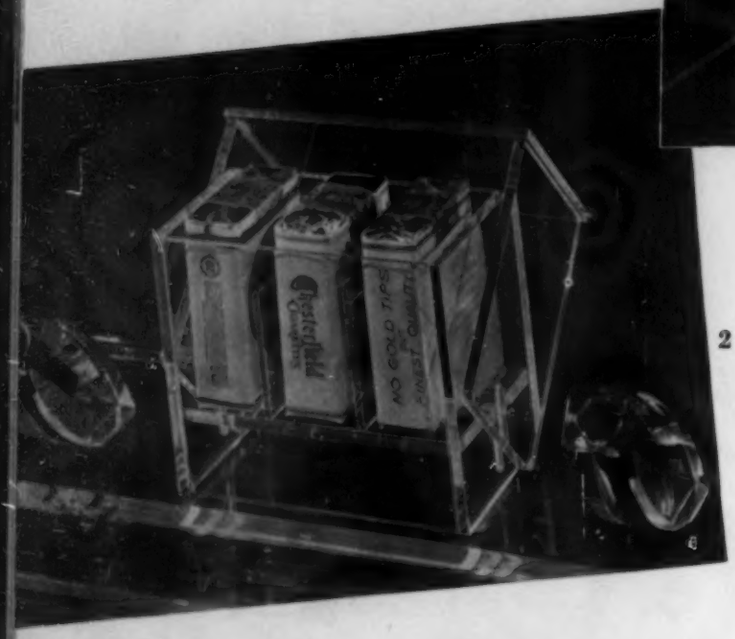
5 Cosmetic and perfume manufacturers are becoming increasingly conscious of the advantages to be derived from using packages that have a reuse value or a permanent decorative appeal. Such a cover is that used by Lucien Lelong for its new Taglio perfume. Lightly decorated with a frosted pattern, this package is fabricated from Lumarith sheet

6 The desire of women for colored accessories as an accent at the throat, ears or wrist is an ever-changing challenge to plastic processors. The Dor-Ard Jewelry Co. has adapted its line to current trends by making cellulose nitrate in the form of loops and twists for sale as earrings, bracelets and clips. All the accessories are offered in a wide range of bright clear colors

7 For more subtle color accents there are these pins carved from Plexiglas by Cermak and delicately tinted from beneath with variously colored dyes. Catalin can be handled in much the same way as evidenced by this paperweight in which a rose pattern has been cut from the center of the material and coloring matter applied to the delicately carved sections

Home Decoration

1



2

1 Without a clock, a household is lost. Even the bedroom and kitchen clocks are not enough. There is need of a dress-up timepiece as well—one like the Winslow Manufacturing Co.'s new Telometer direct-reading numeral clock fabricated by Hubbell and Miller from cast Catalin. But whether for bedroom, kitchen or parlor, a high percentage of the newer clocks are of plastic

2 The list of table and desk accessories—of small home decorations, in fact—is almost endless. And to a great majority, plastics can add new life and charm, as in this cigarette dispenser fabricated of Lucite or Plexiglas by Scattergood of Hollywood—an eye-catcher gracing president Don J. Smith's desk

3

3 Not only in its decorations but in its hardware too, the home is to be brightened by an increased use of plastic materials. Inherent color and resistance to body acids and to stain is one of the chief selling points for products like this molded Fibestos door-knob backplate produced by Worcester Moulded Plastics Company

4 Since beauty and practicality are the by-words of today's housewife, it is no wonder that plastic fabric and plastic coated fabric is making a hit as upholstery material. Stains like the strawberry jam smeared on this Velon covered sofa wash off in a flash

4

5

6

5 Adaptability to mass production, a medium to low price and a durable finish are essential qualities in material used for alarm clocks. For that reason this Telalarm Junior electric clock, designed by the Warren Telechron Co., is to be injection molded of Lustron by the Plastics Div., General Electric Company

6 Beauty by day—drama by night. Such is the double life played by this engraved Plexiglas decorative wall plaque. And the change is effected by piping light up through the sheet from a source concealed in the base

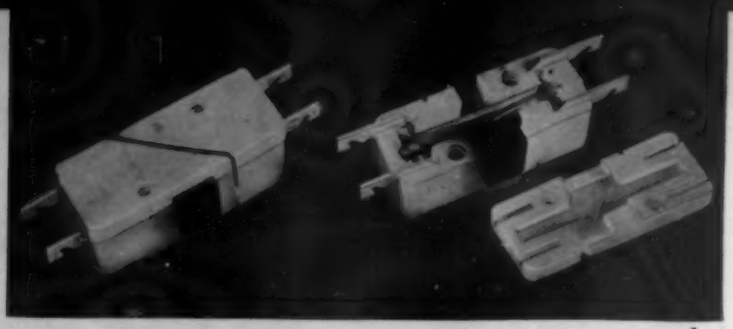
7

7 Even to the conventional table lamp, plastics brings new life. Take, as an example, this shade of Lightolier formed from the palest yellow sheets of Lumarith figured sparsely with green leaves and bound in brown

8 The love of women, and men too, for sparkle and life in home decorations accounts for the popularity of transparent plastics, either colored or in clear tones. Kriston, thermosetting material from which these desk appointments are cast, adds excellent electrical and chemical properties to good optical characteristics

8

INDUSTRY



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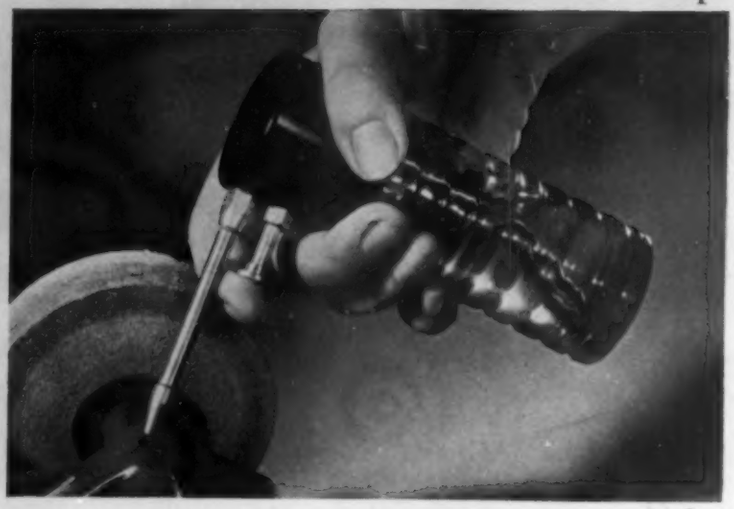

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1 The electrical field is a favorite for plastics, and a glance at these tiny switches, injection molded from FM-1 nylon, does much to explain this popularity. It is due to the special properties of nylon that these pieces are able to withstand heat and strains in the thin intricate sections of the walls

2 An industrial application for plastics that holds forth much promise is this oiler and sprayer in which the half-pint barrel is molded of Tenite II by Columbus Plastic Products Company for the Midwest Production Machine Company. Screwed onto a metal top, this cellulose acetate butyrate container combines toughness and impact strength—a combination which means that the can may be dropped or submitted to hard blows without danger of shattering

3 There is an immense pride among workmen in the appearance and condition of their tools. This feeling extends beyond the working parts and is a partial explanation for the increased use of such plastics as Chemaco ethyl cellulose for the handles of saws, hammers and screw drivers. Sometimes a clear plastic is employed, sometimes an opaque material and again the tool manufacturer may call for a combination of the two

4 After the finish-grind operation on shaft journals, considerable handling of the shaft is necessary before final assembly. If unprotected, the journal surfaces consequently become scarred and scratched, requiring further

finishing. One means of protecting these surfaces is through the use of Micarta journal guards which may either be hinged or threaded. Properly identified they can easily be separated for reuse

5 Behind the scenes, plastics do a tremendous job for industry in gears, in rings, in pulleys and terminal blocks. Like these Bakelite laminated plastic retainer rings for high-speed bearings, many of these parts must be machined to extremely close tolerances

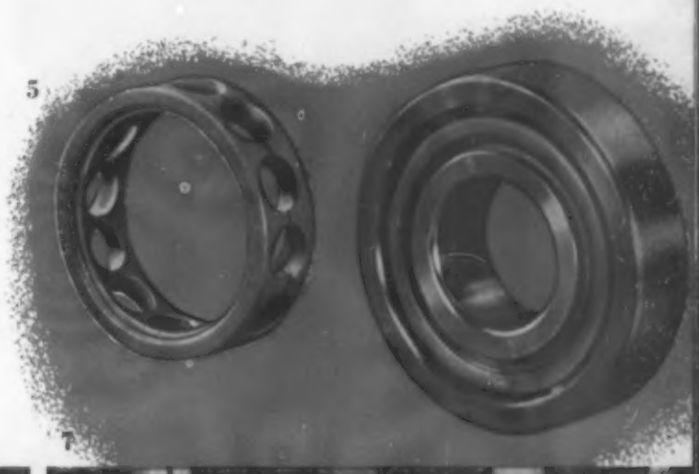
6 Not only industry but the home market will be using increased quantities of plastic coated wiring and cable similar to these Vinylite covered samples. This wiring offers exceptional resistance to moisture, flame oxidation and abrasion

7 Plastic packaging has its practical as well as its aesthetic side. If the latter consideration weighs heaviest with the cosmetic and apparel manufacturer, there are Saran film packages like these for paint brushes which are devised primarily to protect the merchandise both before and after it has been used

8 For equipment subject to extended storage and export shipping, there is the new spray package technique. A machine or like article is first covered with a cross hatching of tape. Over this open structure is sprayed a cobweb-like covering composed of Saran and other resins

9 Reversing the usual, these combination screw drivers and hex wrenches use plastics for the working section and metal for the holder. The part with its molded Durez tip is designed for radio adjustment work

5



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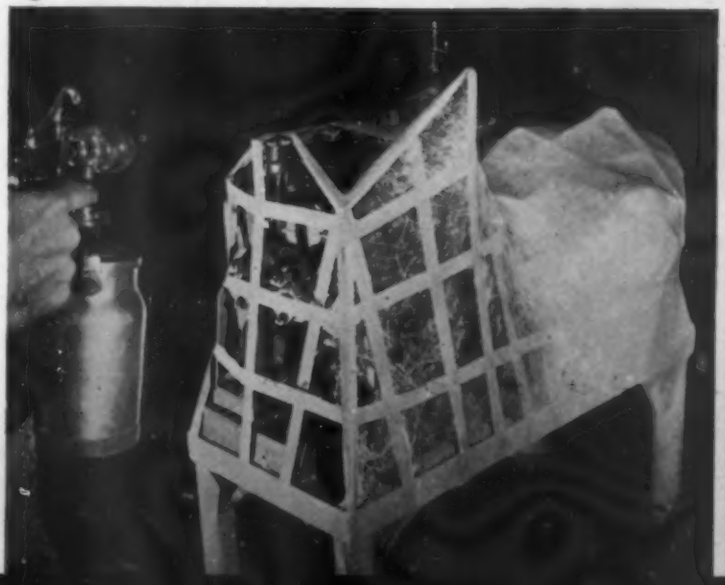

9

HOME UTILITY

1

2

1 To many women, cleaning up around the home means using just as many plastic brushes of one kind or another as they can lay their hands on. Now another product has been added to this line—a hand brush whose bristles consist of extruded Vinylite monofilaments

2 Some of the best examples of how well plastics can work in combination with other materials are to be found in the kitchen. What could be better than a Durez handle, molded by Globe Imperial Corporation, for this Presto cooker which is manufactured by the National Pressure Cooker Company

3

3 Plastics have done much to prove that usefulness does not necessarily mean drabness. A case in point are the Tom Thumb seasoners injection molded of cellulose acetate by Carvanite Products in such colors as red, green, blue and pink. They are attractive enough for any table yet have a push button method of dispensing salt and pepper from the bottom that minimizes the danger of the dispensers clogging up during damp weather

4 New openings are appearing every day for materials that made a record for themselves during the war. The wonder is that the idea of using Compreg for the holders for kitchen knives and carving sets was not taken up extensively before this. Adams Plastics Company manufactures these sets from Compregwood supplied by Parkwood Corporation

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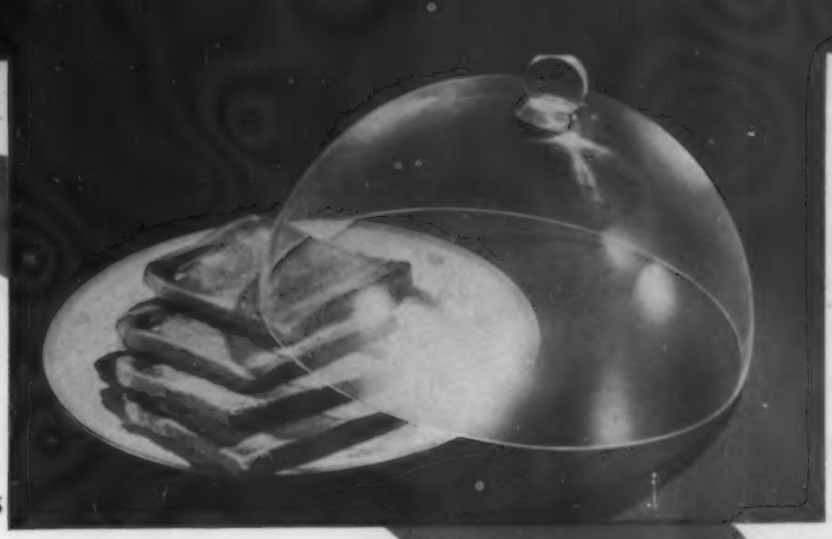

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5 This Lucite toast cover, vacuum formed by Hunton Plastics Company in 8 different diameters ranging from 5 to 14 inches, is another example of housewares now being turned out by methods adapted from those used during the war—in this case in the production of domes and blisters for airplanes. The round handle on the top of this cover is machined to size from acrylic rod stock and cemented in place in a clamping jig

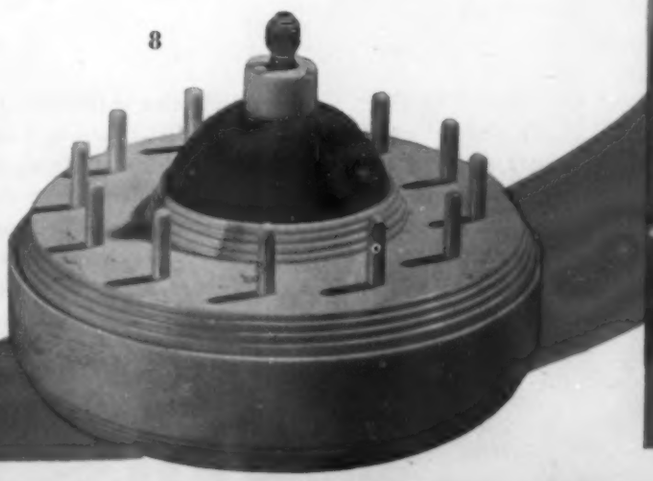
6 A toughness sufficient to prevent it from shattering when dropped on hard surfaces is enough in itself to endear a tumbler or dish to the average housewife. When high resistance to heat is added, permitting sterilization in boiling water, there is little wonder that nylon in such applications as this tumbler, molded by Du Bois Plastics Products, Inc., is attracting attention

6

7 Toasters are just one of the many electrical appliances that are making increased use of plastics—partly because they provide smooth looking surfaces, partly because of their excellent electrical insulation properties and partly because of high heat resistance. In this particular toaster both the base and the fittings are molded of Bakelite

8 Timesaving equipment of almost every type is certain to prove popular with the women—the principal buyers for a family. For example, one of the chief attractions of this compressed molded Plaskon urea sewing kit is the circle of vertical posts provided as a holder for spools of thread. W. L. Stern Company uses extruded cellulose acetate for the center spindle

7



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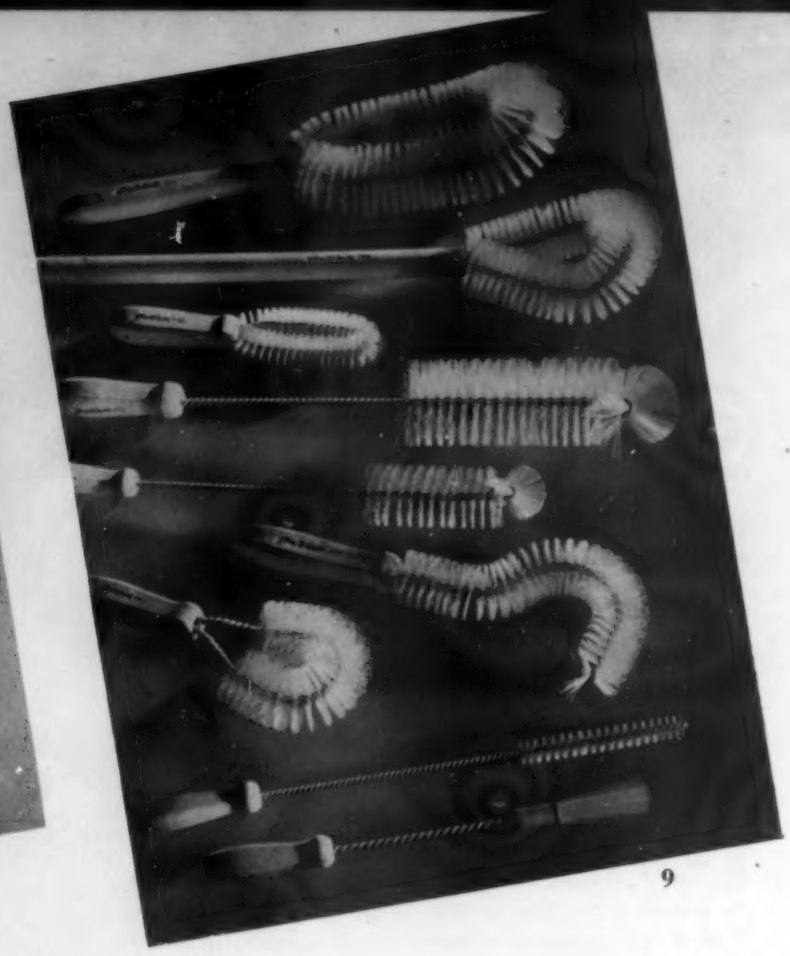

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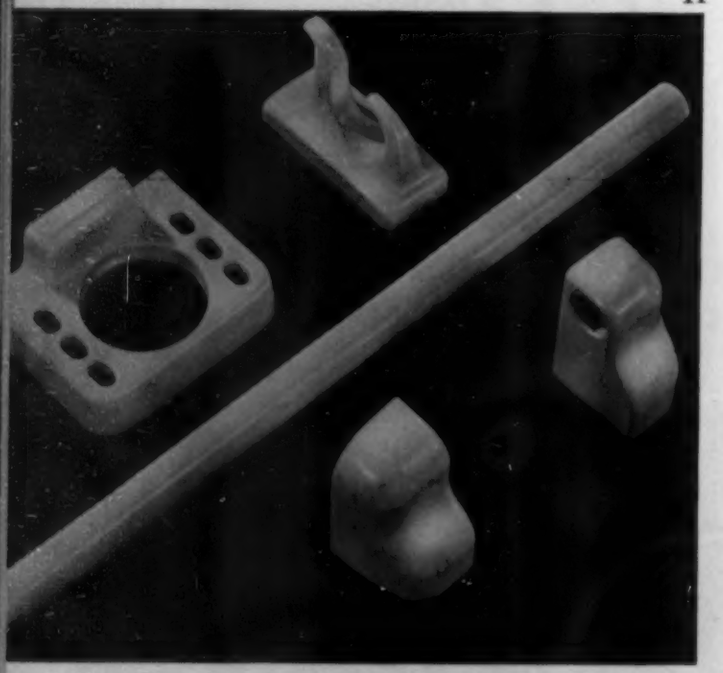
HOME UTILITY

11



9 This array of the Kellogg Brush Manufacturing Company's household brushes with nylon bristles shows not only how much cleaning there is to be done around the average home but the adaptability of these synthetic bristles to almost every scrubbing operation. Besides durability, nylon bristles have the virtues of quick drying, non-fraying and non-drip which is an important factor for these household items

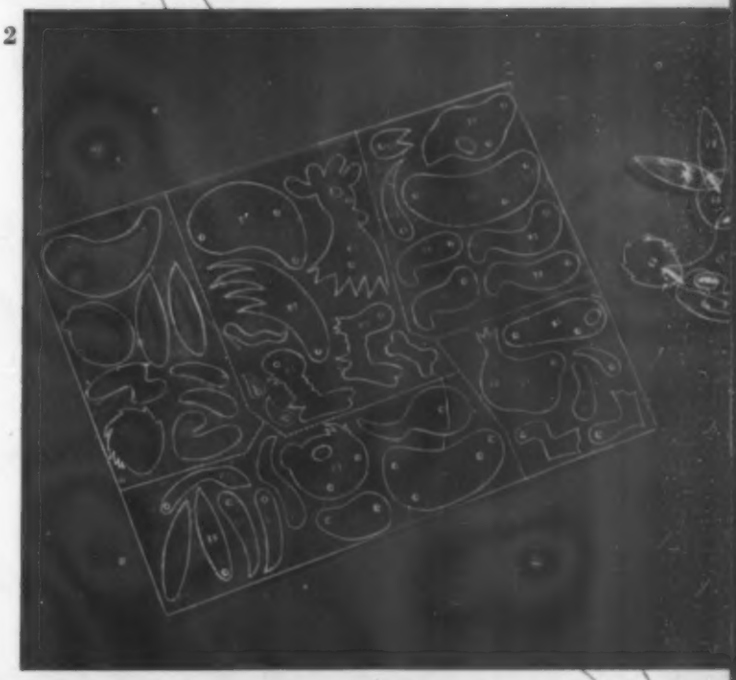
10 Another new application of Styron is in this Pour-Ez bottle cap that comes in either white or red in sizes to fit either pint or quart bottles. Permanency of color and lightweight were important factors in the selection of a plastic material in preference to metal. The narrowing of the field to polystyrene is attributed by the manufacturer, Allied Appliance and Plastic Company, to this material's good molding qualities as well as to its resistance to heat

11 Again and again the fact that color is inherent in a plastic material has stimulated the increased use of these materials. This quality, combined with lightweight and resistance to crazing, explains in part the application of Styron to the bathroom fixtures produced by Columbus Plastic Products, Inc. While these selected samples are all white, the entire Lustro-Ware line is also brought out in pastel green, bright red and black and may later be available in other colors

1

JUVENILE MARKET

A toy that delights—the grownup as well as the youngster. Molded of Lumarith by the Master Plastics Molding Corporation, the monkey moves up and down the string at the slightest tug on one or the other end of the cord



2

A sheet of cellulose acetate stamped with the bodies, legs, tails and ears of a dog, a rabbit, a rooster, a donkey and a duck. Cut out and assembled with pin clips these transparent sections become adjustable animals—made by Revell Plastics of Precision Specialties

Who would have thought that the seawater distillation bags would develop, upon conversion to civilian life, into huge playballs. Produced by the DuPage Plastics Company from strips of Vinylite joined in strong airtight, watertight seams by heat sealing, the balls are fun for all

3

JUVENILE MARKET

4

5

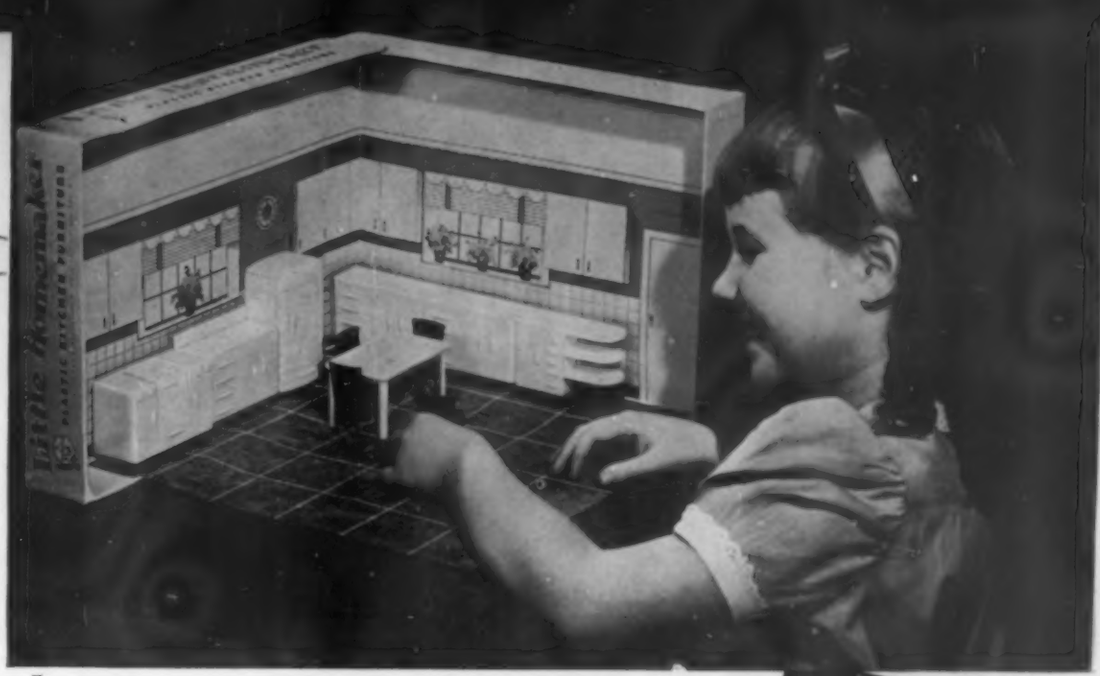
4 Baby furniture offers a fertile field for plastics. An excellent example of just what can be done on these lines is the tray for the Safe-T-Bilt high chair, a product of the Williamsburg Chair Factory, which is molded of high impact melamine by the Chicago Molded Products Corporation. Besides being odorless and tasteless, the tray can be cleaned in a jiffy—even scalded if necessary. And it is rugged enough to withstand the hardest kind of use and keep its sleek appearance

5 Dolls are without doubt the most popular and the longest lived, as far as continued interest is concerned, of all toys. From crib age to the teens, dolls are a must for every girl. And during this period they are subjected to quantities of loving, treatment that this cellulose acetate doll molded by Ideal Toy and Novelty Company is well able to withstand

6

6 Plastics have made it fun for children to save money. One of the latest entrants in this field is the fare box savings bank produced by Stack Plastics. With its base and top injection molded from Lumarith in a variety of colors and its transparent portion fabricated from the same material, this bank catches the eye—and the ear too, since it is equipped with a bell that rings when a coin is deposited. And in other ways it resembles the real thing with swinging doors actuated by a crank and a transparent coin chute

7 Daily, it seems, the toy industry is making better and better use of plastics' ability to reproduce, to the last detail, the contours of articles in everyday use around the home. The toy kitchen furniture molded of cellulose acetate by the Plastic Art Toy Corporation of America might be cited as exemplifying this trend. An especially clever feature of this Little Homemaker set is the way in



7

which the inside of the box is printed with the outlines of doors, windows and tiling so that together they form two sides of a play kitchen

8 Calico cats and old rag dolls are fast disappearing with the plastic era and it is easy to see why. Celluloid toys such as these are more sanitary, just as sturdy and hold the same appeal for children. As can be seen, the toys are made up of many molded parts and fitted together in assembling. Noveloid Company, Inc., does the processing and distributing

8

9 No discussion of plastics in the young market is complete unless mention is made of the use of this material for children's tableware. One design is that put out by the Eclipse Moulded Products Company using Styron, Plaskon and Tenite. Included in this line are a fork, knife and spoon set, and a tumbler

9

10 Something out of the ordinary in action toys for baby are these new plastic items, injection molded of methyl methacrylate and marketed by Agate Plastics Corporation. The sturdy Gyro teether, eye-catching in four colors, has three moving parts which provide plenty of action for adventuresome young fingers. The 4 1/2-in. plastic fish, attractively fabricated in three colors, features durable construction and movable eyes

10

In office and shop

1

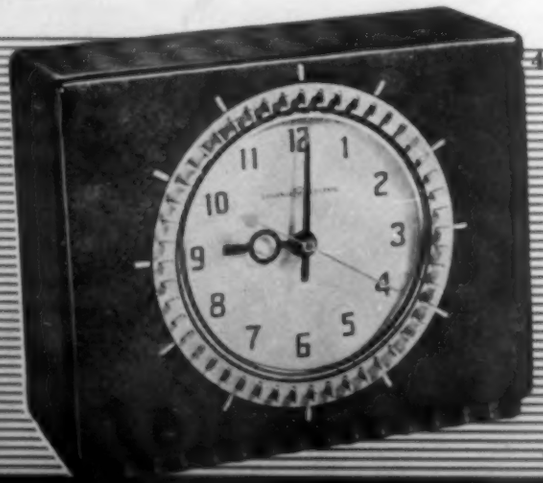
2

1 Plastics as an interior construction and finishing material are coming in for more and more notice these days—particularly for applications subject to hard and long wear. How well they meet these conditions is evidenced by these counters surfaced with Formica paper-base laminate impregnated with Melmac resin. The material will withstand long and hard use

2 Because of the successful performance of just such items as this syrup dispenser, molded of Melmac by the Plastic and Die Cast Products Corporation for the Weber Show Case and Fixture Company, this plastic material is cutting out for itself quite a field in those applications demanding maximum strength and a total absence of taste or odor. It comes in many colors and is one of the first thermosetting, shock resistant plastics available in color

3 There are many people who were familiar with plastics before they recognized their existence. And in many cases this foreknowledge can be attributed to their fond attachment for a particular fountain pen such as the new Tenite II Stratford Regency pen, manufactured by Salz Brothers, Inc.

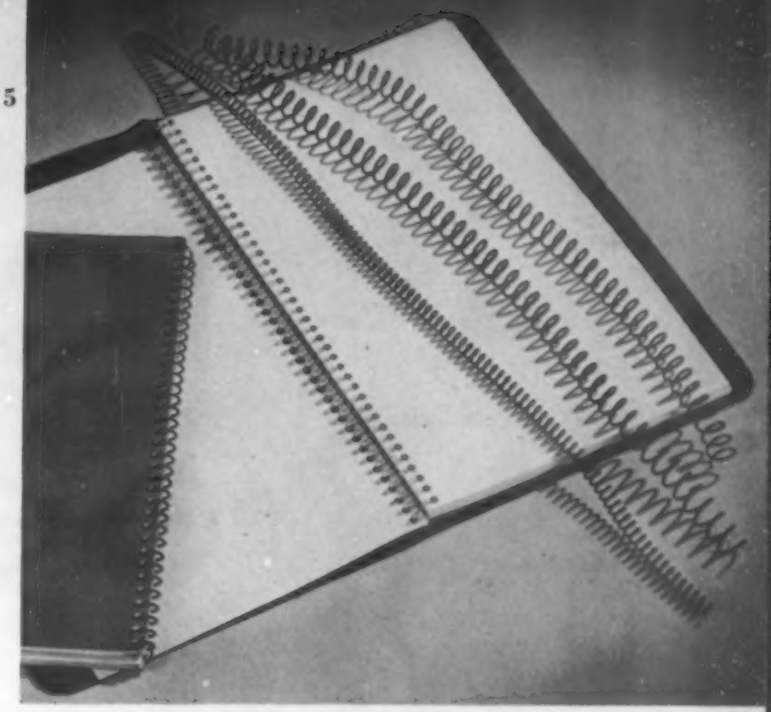
3



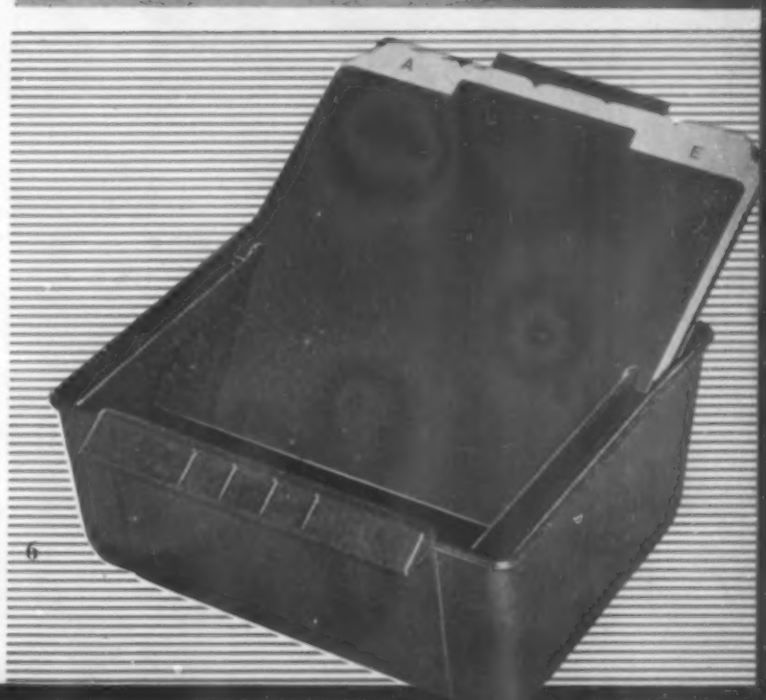
4

4 This chestnut color compression molded phenolic case for the Selecto-O-Switch clock is just one of many clock housings being turned out by the General Electric Company. In fact housings of this type are a familiar plastics application

5 Memo pads, stenographers books, advertising presentations, notebooks, advertising literature—these are but a few of the applications to which spiral binding is becoming indispensable. Like the examples shown here, which were extruded from Tenite II and Styron by Spiral Binding Company, Inc., this binding can be used in three ways: exposed, semi-concealed and concealed. The plastic is first extruded in standard gages, then the spiral formed to the desired diameter and pitch, and cut to the proper length. The exposed spiral is the least expensive and most generally used. The semi-concealed and concealed spirals fall into the quality group

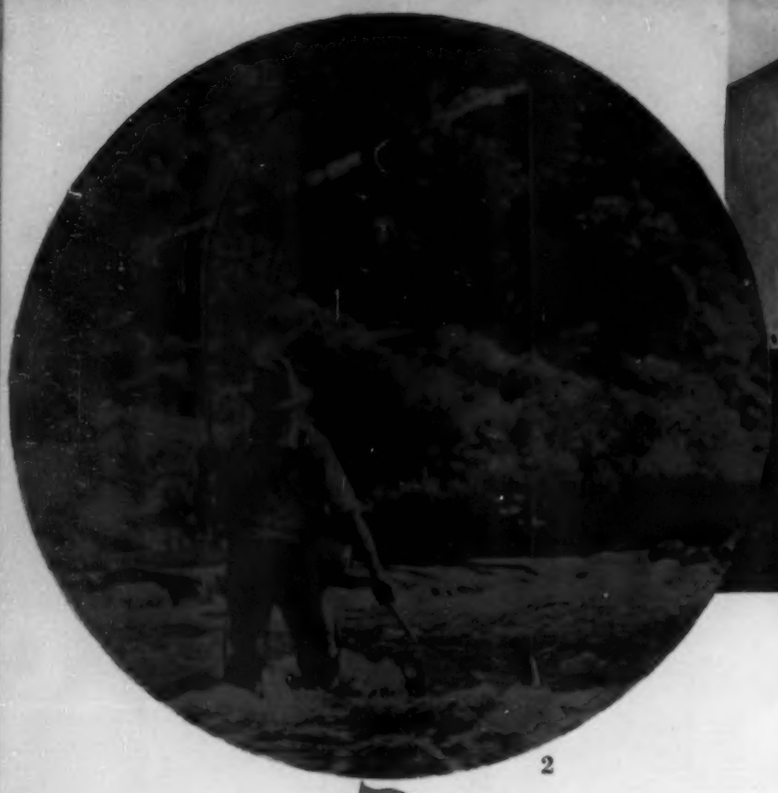


6 The file box is that indispensable office fixture without which a day's routine becomes a hopeless confusion. Typical of the use being made of plastics for this application is this holder molded of Durez by the Globe Imperial Corporation for Cumins Perforator Company. Like all plastic boxes of this type, it has the advantage of light weight and a strength that allows it to absorb the customary knocks and bumps of office life without scratching or denting



7 The rich effects that can be achieved with resin-bonded decorative laminates is evidenced in these telephone booths at the Washington National Airport. Both the booths and counter front are faced with Formica Realwood finished on the surface with Bakelite phenolic resin varnishes

1



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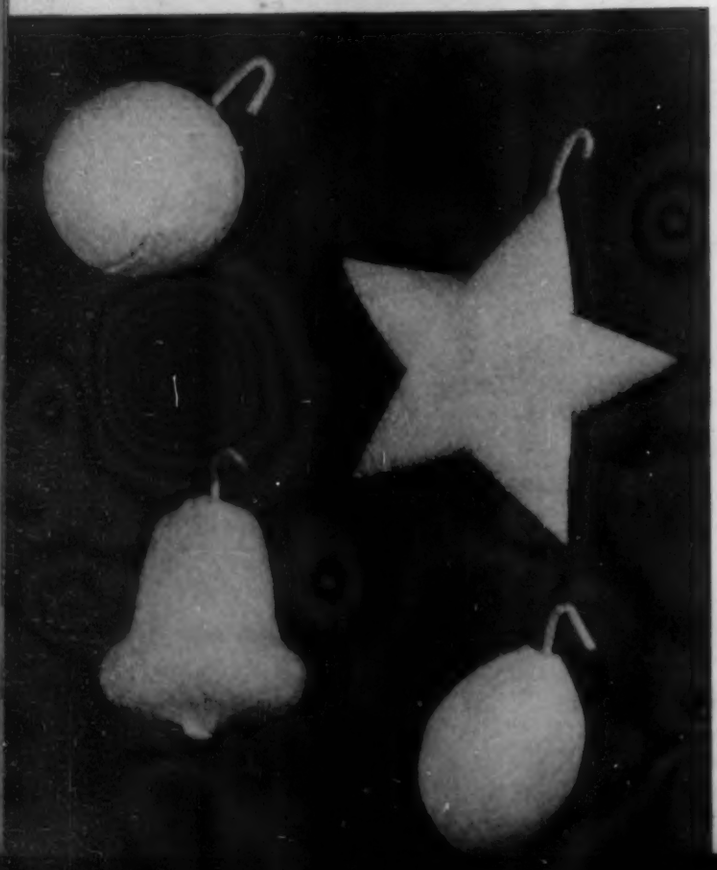
PLAYTIME PLASTICS



3

1 The use that is being made of plastics for the top and upholstery of convertibles represents but a fraction of the market for plastics in the automotive field. But this ivory finished Duran, a film made from Geon by the Masland Duraleather Company, will eventually be available in almost every color, ready for use in station wagon, sedan or bus

2 If your vacation is spent in the mountains or in the cool backwoods, the chances are growing that the fishing equipment you've brought along will either be made entirely of plastics or depend in part upon synthetic resins for its strength and resiliency. Such is the case with the nylon lines, leaders and snelling hooks turned out by Ashaway Line & Twine Co. for sale by the Nassau Tackle Company

3 Decorations are another playtime plastics application which, while neglected during the war, should be coming back in full force before another year rolls around. Colored cutouts and blown balls are two possibilities. Schwab & Frank Inc., have offered this expanded cellular plastic bell and star as ideal ornaments which need not be confined in their use to the Christmas season. They are distributed by Frank Paper Products

4 Photography probably makes greater, and more exacting, use of plastics than any other hobby. Besides camera housings and accessories there is all the dark room equipment, like this molded Resinox adjustable roll film tank, print tray and deep tank for cut film developing which is being offered by Windman Bros. The advantage of the phenolic is that it is resistant to acids and will not distort when subjected to heat or long water immersion

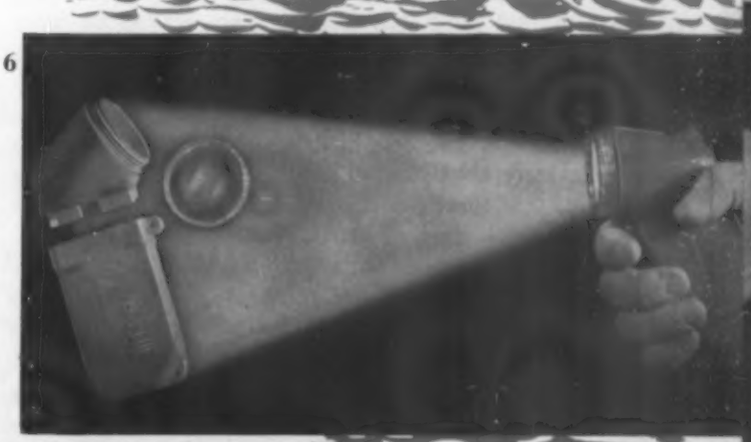
5 Boating enthusiasts are becoming increasingly alive to the possibilities of plastics materials for the hulls as well as the accessories of their boats. Illustrative of

4

5

the developments in this field is the 8-ft. Corolite Coracle dinghy molded from Co-Ro-Lite, Durez resin impregnated sisal fiber, by Donald B. Abbott

6 Among the many plastics applications that smooth the way to pleasanter playtimes is this Daco-Lite flashlight, molded of Chemaco ethyl cellulose by Plastics Engineers, Inc., which carries its own pint-size generator and lights up instantly when its handle is gently and rhythmically squeezed. With both case and lense produced of ethyl cellulose, this Dayton Acme Co. light is practically unbreakable—one of the great advantages of plastic flashlights as a whole



6

7 Even picnicking is made more enjoyable through the use of plastic tableware such as this gayly colored line molded of Melmac which is tasteless, odorless and chemically inert. In addition the dishes and tumblers won't break easily and are light enough not to be a burden if the picnic is some distance from the house

7

The plastics industry has come of age

THE first National Exposition of plastics products at the Grand Central Palace in New York during the week of April 22–27 under the auspices of the Society of the Plastics Industry marks the arrival of plastics into its majority. Like the young man just reaching 21, the industry is displaying its accomplishments and exposing its character to a public who have been watching the young man develop through the war years.

The young man, Plastics, has had his full share of escapades and experienced the usual exciting and emotional adventures of teen age youth. In his effort to get ahead too fast the young industry, in typical youthful enthusiasm, has sometimes put his material in the wrong places before it was perfected.

However, the youngster is properly cautious of all the fanfare that greets his arrival at majority, for he has already learned that the public always is fascinated by mystery or newness as typified by plastics. He knows that when the glamour has receded he must prove that he has the actual ability to do the job expected of him.

Men in the plastics industry are conscious that the test tubes and retorts have barely begun to give out their secrets. Every serious thinker in the industry knows that there is much to learn. There is scarcely a forward-looking man in the field who would dare to say "it can't be done" to the fanciful ideas frequently presented to him. The "can't be done" attitude has been knocked into a cocked hat so many times in this industry that no man dares to use the words.

It has been a long, hard pull since John Wesley Hyatt discovered celluloid in 1869 and started the young infant, Plastics, on its way. Like the youngster who goes through measles, mumps and diphtheria, plastics has had its share of adolescent troubles in varying degrees—flammability, toxicity, lack of stability beyond certain temperature ranges, brittleness, etc. Other weaknesses in some types have boomeranged back on other types without those weaknesses because the public has not yet learned to distinguish between the different characteristics of plastics materials. Unfortunately the word *plastics* means only one material to too many people. They have not yet learned that cellulose acetate, polystyrene, phenolics, ureas and other materials are as different from each other as iron, steel, copper or lead.

Only education and good public relations activities such as the Grand Central Palace Exposition will remedy these misunderstandings and lack of knowledge. It is here that the public can see and feel the varied uses and different types of the new material.

The plastics young man will be exceptionally proud as he exhibits his characteristics represented in products made from some 30 materials that will be on display. He will admit possible shortcomings just as other materials have shortcomings—combustible wood, corrosive iron or breakable glass—to give just a few examples. But he will counter his shortcomings with such desirable qualities as excellent electrical properties; brilliant color with resultant eye and sales appeal; light weight with strength generally greater than materials of corresponding weight; corrosive resistance equal or better than that generally encountered; moisture and mildew resistance that have been proved under the rigors of war.

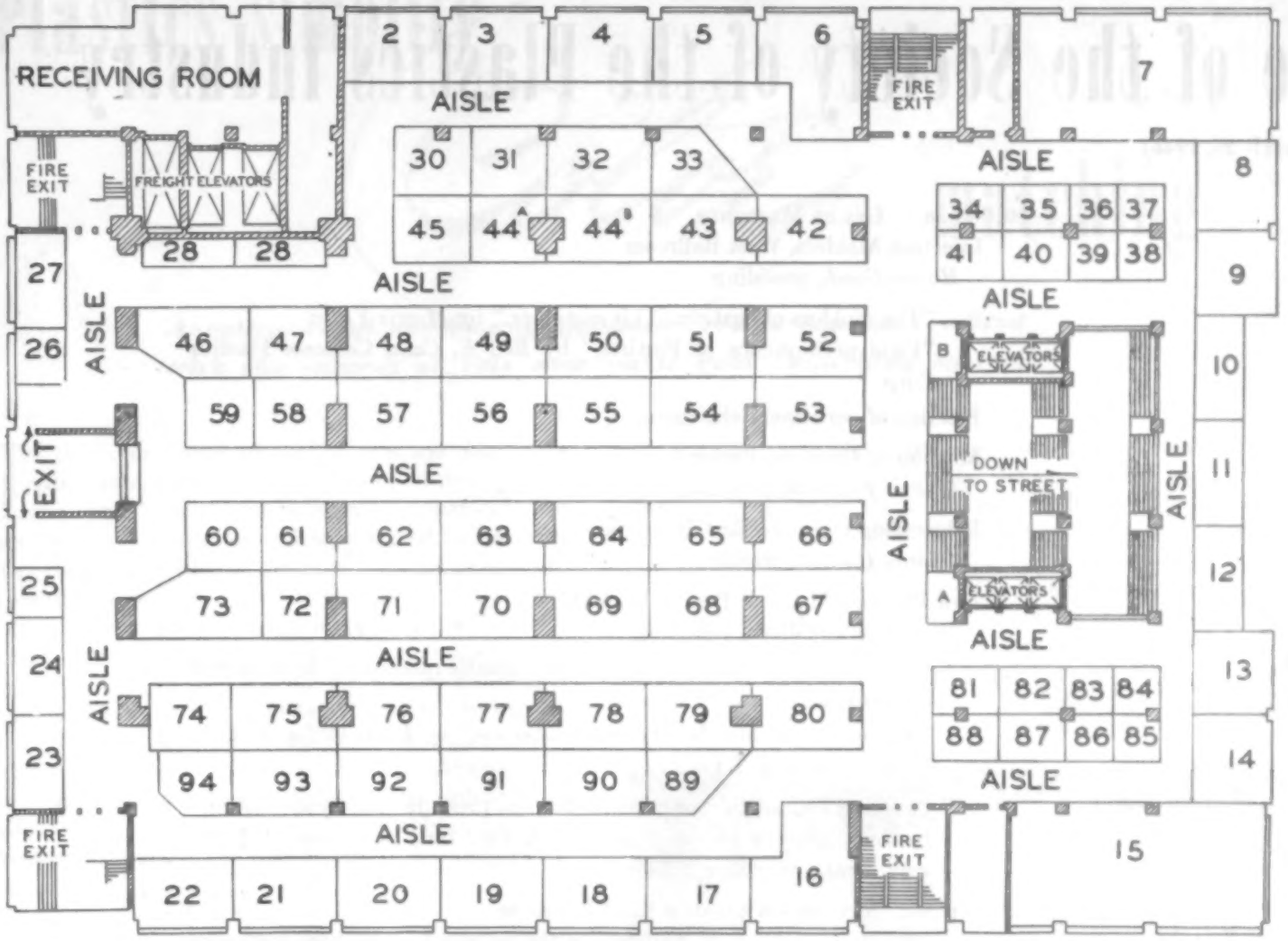
Furthermore this oncoming young hopeful will show how he can work with other materials to the advantage of both. Let him work with wood, and the latter frequently becomes vermin- and moistureproof as well as fire resistant. Impregnated in fabric or paper, a new material with unusual strength and uses is born; used with glass and the result is, pound for pound, one of the strongest materials known; wedded to metals, the uses of both will be expanded far beyond present-day applications. In fact, some of the youth's most enthusiastic sponsors insist that his future is more dependent upon how he mixes with other materials than upon his own individualism.

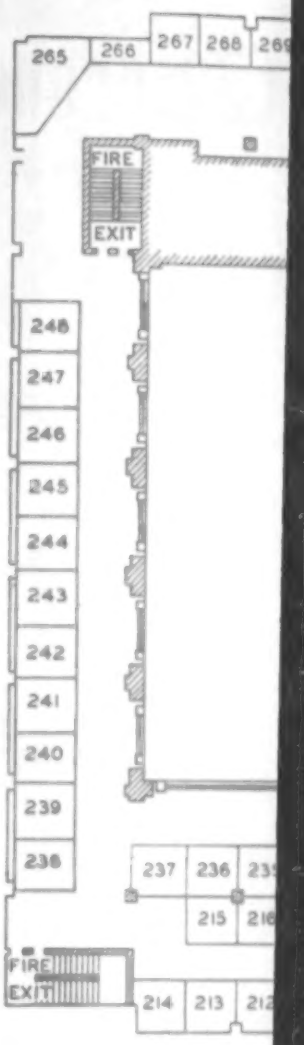
The plastics youngster will tell you that production of cellulose derivatives and synthetic resins has grown from about 55 million pounds in 1929 to over 900,000,000 in 1944. He can't tell you the money value of the finished products made from these raw materials because they have gone into almost every form of industry and no one has been able to separate them. Various estimates have been made, but in the opinion of MODERN PLASTICS' editors none of them has covered the entire field. We are inclined to take the highest estimate of all—$500,000,000, as worked out by General Electric statisticians—and even that is a low figure if such things as coating materials, movie film and other plastics items, not generally listed in plastics statistics, are included.

TEAR THIS OUT AND TAKE WITH YOU

TEAR THIS OUT AND TAKE WITH YOU

Floor plans and listing of exhibitions for the P





FIRST FLOOR

Company	*Booth Number*
Acadia Synthetic Products	328
Airtronics Manufacturing Co.	41
American Cyanamid Co.	70–71
American Insulator Corp.	90
American Machinist and Product Engineering	52
American Plastics Corp.	26
American Technical Society	316
Amos Molded Plastics	282
Anchor Plastics Co.	335
Andover Kent Aviation Corp.	247–248
Anigraphic Process, Inc.	252
Art Roll Leaf Stamping Co.	341
Atlantic Plastics, Inc.	338
Bachmann Bros., Inc.	67
Bakelite Corp.	68–69
Baldwin Locomotive Works	234–235
Bassons Moulded Products	245–246
Boonton Molding Co.	226–227
Borkland Laboratories	289
Bull, J. C., Inc.	89
Burckel, Christian E., & Associates	322
Carver, Fred S.	344–345
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Celanese Plastics Corp.	54–55
Celluplastic Corp.	279–280
Chemaco Corp.	25
Chicago Molded Products Corp.	332
Clark, George V., Co., Inc.	326
Cleveland Container Co.	222
Cleworth Publishing Co., Inc.	A
Columbia Protektosite Co., Inc.	21
Columbus Plastic Products, Inc.	263–264
Creative Plastics Corp.	60
Croasdale & DeAngelis, Inc.	85
Cruver Manufacturing Co.	287
Defiance Machine Works	75
Denison Engineering Co.	27
Despatch Oven Co.	257
Detroit Macoid Corp.	47

Company
Detroit Mold Engin
DoAll Eastern Co.,
Dow Chemical Co.
du Pont de Nemours
Durez Plastics & Ch
Durite Plastics, Inc.
Eclipse Moulded Pr
Electronics Plastics
Elmes Engineering Foundries
Emeloid Co., Inc.
Erie Resistor Corp.
Eriez Manufacturin
Flexmir, Inc.
G. M. C. Process C
Gemloid Corp.
General Electric Co
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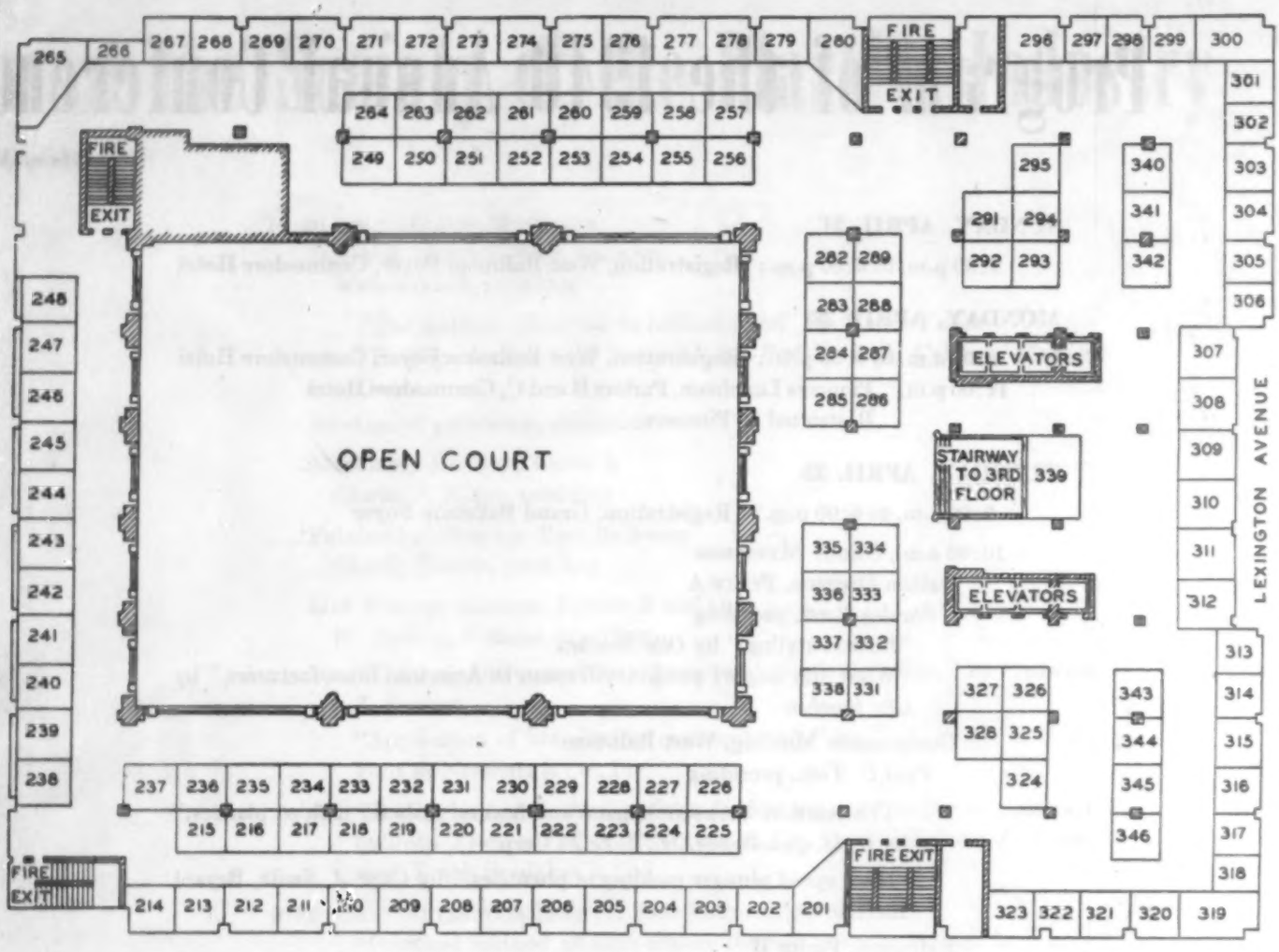
ıs for the Plastics Exposition at the Grand Central Palace

(As of March 29, 1946)



SECOND FLOOR

Company	Booth Number
Detroit Mold Engineering Co.	28W
DoAll Eastern Co., Inc.	294–295
Dow Chemical Co.	62–63
du Pont de Nemours, E. I., & Co., Inc.	7
Durez Plastics & Chemicals, Inc.	10–11–12
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Electronics Plastics	266
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Eriez Manufacturing Co.	239
Flexmir, Inc.	250
G. M. C. Process Corp.	262
Gemloid Corp.	207–208
General Electric Co.	43–44B
General Hard Chrome Co.	205
Girdler Corp.	92
Glasfloss Corp.	260
Goodrich, B. F., Co.	299–300–301
Goodrich, B. F., Chemical Co.	46
Goodyear Tire & Rubber Co., Inc.	3
Gordon Laboratories, J. M.	206
Gottlieb, M. M., Associates, Inc.	37
Graham Machine Tool Co.	253
Grigoleit Co.	30
Hercules Powder Co.	13–14
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Interlake Chemical Corp.	38–39

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Palace, April 22 through April 27

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Nicholl Hard Chrome Service	261
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Radio Receptor Co., Inc.	259
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Raytheon Manufacturing Co.	340
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Shaw Insulator Co.	5–6
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Steiner Manufacturing Co.	283
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Surprenant Electrical Insulation Co.	296
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Taylor Manufacturing Co.	323
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Tri-United Plastics Corp.	331
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U. S. Rubber Co.	15
Universal Plastics Corp.	73
Van Dorn Iron Works	276
Vargish & Co.	336
Velveray Corp.	306
Vickers, Inc.	203–204
Victor Metal Products Corp.	284–285
Waterbury Companies, Inc.	288
Watertown Manufacturing Co.	256
Watson-Stillman Co.	50–51
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Yardley Plastics Co.	36

S.P.I. convention and plastics exhibition guide

REGISTRATION—The registration fee for the S.P.I. annual meeting, with headquarters at the Hotel Commodore in New York City, is $10.00. Payment of this fee admits the registrant to all sessions of the conference. It will also admit him, admission free, to the Plastics Exposition at the Grand Central Palace as frequently as he cares to attend during the week of April 22. By registering in advance those planning to attend the Conference will be relieved of registering when they arrive for the meetings. Advance registrations may be picked up at the time of the meeting, at the Registration Desk in the West Foyer of the Commodore Hotel, the headquarters of the Convention.

MEALS—In connection with the Conference there will be only one principal luncheon and one main banquet. The luncheon will be held at the Commodore on Tuesday, April 23, the price for luncheon tickets being $3.50; the banquet will be held in the Grand Ballroom of the Commodore on Wednesday, April 24. In this case the tickets are $7.50. Guests will be welcome at the luncheon and dinner. Tickets for guests can be purchased only by one who is duly registered at the conference. The Committee reserves the right to restrict attendance at these functions, if necessary, to those who are registered inasmuch as the capacity of the ballroom is limited. Black tie will be optional at the banquet.

NATIONAL PLASTICS EXPOSITION—The Exposition will be held at the Grand Central Palace. The dates for the Exposition are from April 22 to April 27 and will be open during the hours set forth below:

Monday, April 22	11 a.m. to 10 p.m.
Tuesday, April 23	11 a.m. to 10 p.m.
Wednesday, April 24	11 a.m. to 6 p.m.
Thursday, April 25	11 a.m. to 10 p.m.
Friday, April 26	11 a.m. to 10 p.m.
Saturday, April 27	11 a.m. to 6 p.m.

Admission to the Exposition on the first three days, April 22, 23, and 24 will be restricted to the trade; only duly invited persons and individuals representing responsible business interests will be admitted. The Exposition will be open to the public on April 25, 26 and 27. The admission charge will be $1.00, plus tax.

As an added attraction movies on plastics will be shown on the third floor of the Grand Central Palace throughout the week at regularly scheduled hours, to be announced later.

CONFERENCE PROGRAM EXTENDED TO INCLUDE THURSDAY, APRIL 25—Since the initial program of the Conference was arranged, the Meeting Committee has extended the activities to include the morning of Thursday, April 25. At that time, there will be group meetings of the Accounting Division and the recently formed Plastic Film, Unsupported Sheet and Fabric Division. Those attending the Conference are cordially invited to these meetings.

Program of the 1946 Annual Conference

(As of Marc

SUNDAY, APRIL 21

2:00 p.m. to 6:00 p.m.: Registration, West Ballroom Foyer, Commodore Hotel

MONDAY, APRIL 22

9:00 a.m. to 6:00 p.m.: Registration, West Ballroom Foyer, Commodore Hotel

12:00 p.m.: Pioneers Luncheon, Parlors B and C, Commodore Hotel
Restricted to Pioneers

TUESDAY, APRIL 23

9:00 a.m. to 6:00 p.m.: Registration, Grand Ballroom Foyer

10:00 a.m., GROUP MEETINGS

Button Division, Parlor A

Stanley Borél, presiding

"Button styling," by *Otto Boschen*

"What the import market will mean to American manufacturers," by *Otto Boschen*

Compression Molding, West Ballroom

Paul C. Tietz, presiding

"The relation between impact and flexural tests for molded plastics," by *H. M. Quackenbos, Jr.*, Bakelite Corp.

"High speed plunger molding of phenolics," by *Chas. J. Smith*, Bryant Electric Co.

Extrusion, Parlor B

Fred Petersen, presiding

"Rocket dry extrusion"

12:15 LUNCHEON, Grand Ballroom—*G. K. Scribner*, presiding

1:30 Greetings from the British Plastics Industry, by *Dr. W. J. Worboys*, Vice Chairman, British Plastics Federation

1:45 "The development of the atomic bomb," by *Major General Leslie R. Groves*

2:15 p.m. ANNUAL BUSINESS MEETING

Committee Reports

a. Technical committee, *N. J. Rakas*
b. Educational committee, *Horton Spitzer*
c. Accounting committee, *R. S. Oliver*
d. Public relations committee, *John Sasso*
e. Report of the executive vice-president, *Wm. T. Cruse*
f. Report on election, tellers

3:00 p.m.: AFTERNOON SESSION

Charles Breskin, presiding

"The material supply situation," by *W. S. Landes*, P.M.M.A.

WEDNESDAY, APRIL 24

9:00 a.m. to 6 p.m.: Registration, Grand Ballroom Foyer

nference of the Society of the Plastics Industry

(As of March 29, 1946)

10:00 a.m.: GROUP MEETINGS

Injection Molders, West Ballroom

Horace Gooch, presiding

"The molders obligation to his customer," by *Morris Yellin*

"Field performance of Forticel," by *Bert E. Cash*, Celanese Plastics Corp.

Election of permanent chairman

Machinery Division, Parlor A

Charles F. Elmes, presiding

Fabricating Division, East Ballroom

Charles Hunton, presiding

Low Pressure Molders, Parlors B and C

W. Burdette Wilkens, presiding

"The competitive position of structural plastic materials," by *Frederick Z. Pearson*

"Application of low density core materials," by *R. A. Hoffer*, E. I. du Pont de Nemours & Co., Inc.

"Tooling and production methods for low pressure reinforced plastics," by *John Avignone*, M. A. Cumming & Co., Inc., and *John J. Townsend*, Frank Snedaker & Co.

2:30 p.m.: AFTERNOON SESSION, East Ballroom

"Practical method of heat sealing thermoplastics with high frequency energy," by *Wiley Wenger*, Radio Corporation of America

Demonstration of electric sewing machine.

"Massachusetts institute of technology plastic research project," by *Frank Carman*, P.M.M.A.

"The plastics picture in South America,'' by *C. C. Concannon*, Chief, Chemicals, Drugs and Pharmaceutical Unit, U.S. Department of Commerce "Low pressure molding," by *Jack Stokes*, Bakelite Corp.

6:15 p.m.: COCKTAIL HOUR, East West Ballroom Foyer

7:30 p.m.: DINNER, Main Ballroom

N. O. Broderson, presiding

Hyatt award presentation

Toastmaster, *Dean Richard F. Bach*

"Making the best of it," by *Dr. Preston Bradley*, Peoples Church, Chicago, lecturer and author

Fred Waring and his Pennsylvanians

THURSDAY, APRIL 25

10:30 a.m.: Accounting meeting, Parlor A.

10:30 a.m.: Plastic film, Unsupported Sheet & Fabric Division—West Ballroom

F. J. Groten, presiding

"The necessity of sound test methods and their correlation to end use," by *Chas. Dorn*, J. C. Penney Co.

Plastics simplify color matching

Acrylics, vinyl sheets and polyester resins can be credited with the success of this new paint color matching system

TO the home owner whose first postwar project is redecorating, to the hotel and apartment people who must have the latest in color treatment, the new Martin Senour color system, designed for use with that company's Nu-Hue decorative paints, is literally a sight for sore eyes.

To the paint dealer, who in the past has had to stock a complete line of paints including both fast and slow moving colors; to the suffering but seldom-pitied professional decorator who has labored to match, by experiment with oil colors, weird tints dreamed up by particular customers; to the fabric and carpet people who have seen their delicate shades challenged by unharmonic paint colors, this color system is probably one of the greatest advances in the long history of decorating and painting.

And its application was made possible through the brilliant use of merchandising equipment fabricated and molded of plastics.

Ten acrylic sheets form color cone

The new system, developed by color consultants Carl Foss and Fred Rahr, uses six carefully selected hues of yellow, red, orange, purple, blue and green, plus both a flat and a shiny white, and a neutral grey to produce 1000 evenly spaced tints, tones and shades. Each of these many different tones has its own number and formula.

Key to the system is a set of ten Plexiglas sheets which form a "color cone." These sheets contain small circular chips of the tones. The bottom sheet bears the strong deep tones, each succeeding sheet a set of tones about 10 percent lighter than those on the sheet immediately below it. This progression leads to the pastel tones and white at apex of cone. In the center of each sheet is a grey tone, an intermediate neutral average of all hue values on the sheet. Moving out from the grey center the colors contain less and less grey until, at the outside circle of each sheet they are pure in their full strength.

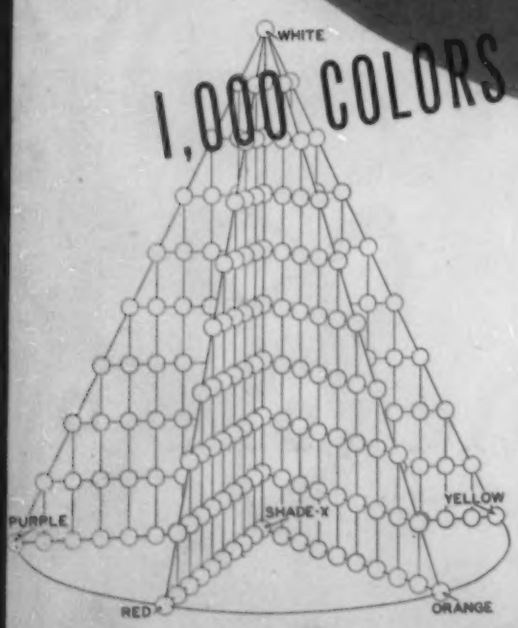
The Steiner Manufacturing Co. fabricates these sheets by drilling holes the size of the colored chip disks. On the back of each chip is its formula number. The chips are placed in the holes and another sheet of trans-

ALL PHOTOS, COURTESY FREDERICK H. RAHR, INC.

Decorators now have a convenient way of transporting color samples in this carrying case. It is low pressure molded of a cotton fabric impregnated with polyester resins and houses 1000 cards, each bearing a sample of a different color of paint. Vinyl separators divide the case into ten sections. The top of the case houses cellulose acetate visualizer cards

1,000 COLORS IN PAINT

COLOR PLATE, COURTESY MARTIN SENOUR PAINT CO.



To simplify matching of colors for paint dealers, decorators and designers, a system has been devised which makes use of ten acrylic sheets each containing a range of small circular color tone disks. These sheets, when placed one on top of the other, form an imaginary color cone which has strong deep color values at the bottom and graduates in tone up to white at the apex. The colors on each individual sheet also increase in value from a grey at the center to a strong pure color at the outside circle of the disks

parent acrylic resin laminated over each of the color-holding sheets.

The retail paint salesman, or the decorator, has only to lay one of these color sheets over the customer's sample of drapery fabric, floor covering or wall paper to find the paint that will match or harmonize. He then reverses the acrylic sheet and gets the formula number from the back of the color chip he has chosen. In less than 10 minutes, referring to the formula and using no more than two of the six basic colors and/or grey or white, the paint salesman or the interior decorator can make up the paint he wants.

An acrylic box with vinyl separators

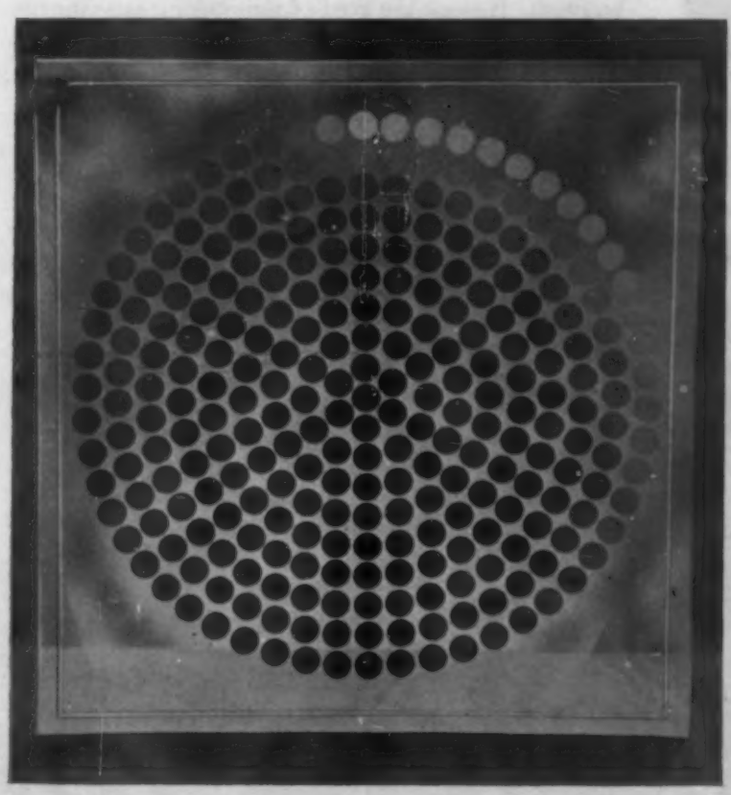
Each retail store selling the Nu-Hue paints is supplied with another plastic unit in the merchandising plan, a Plexiglas box fabricated by Steiner Manufacturing Co., and designed so it holds 1000 cards. The front of each of these cards is an actual paint sample of one paint color; the back contains the formula number and the formula by which paint can be mixed to exactly match the hue of the chip in the acrylic color charts. Between each group of color cards in this box is a printed and laminated Vinylite separator card made by Hopp Press, Inc. Thus each of the color charts in the set of ten is represented in the box by one section of cards. Fredrick H. Rahr, Inc., has designed this box as well as the carrying case which is described in the paragraph below in considerable detail.

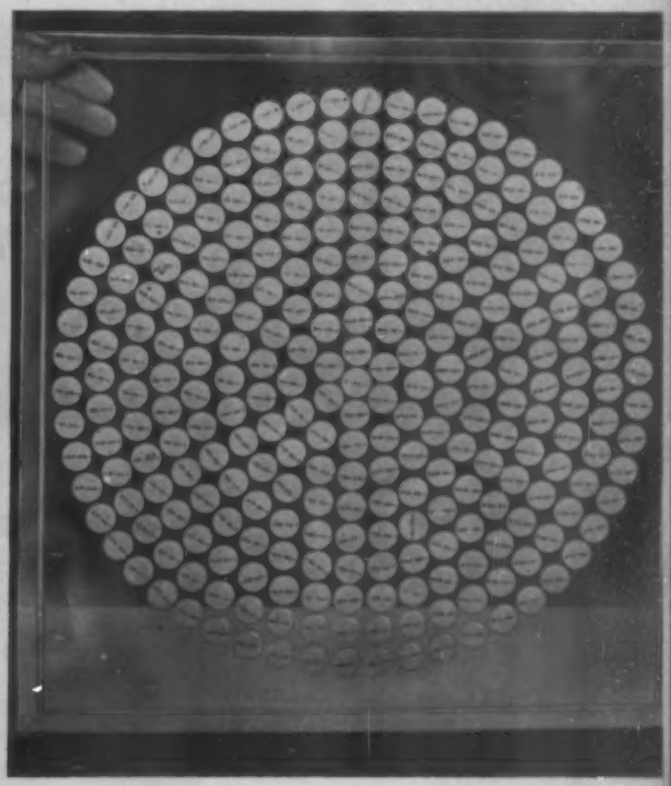
A low pressure molded carrying case

For the decorator or paint contractor who is entering homes, restaurants or other places, there is a similar piece of equipment. This is a streamlined low pressure molded carrying case which is manufactured by the Andover Kent, Inc., using a patented cotton fabric impregnated with a Bakelite polyester resin. The case contains a full set of the formula and color cards, vinyl separators again being used. Like the transparent acrylic case for the retail paint store, this holder is constructed with a piano-type hinge.

The professional decorator's color sample carrying case contains another piece of equipment which makes use of transparent plastics. This is the color visualizer consisting of a set of cards each of which represents one of the main rooms in the home. On the front of each card is a transparent acetate sheet on which the outlines of room and furnishings are printed. It is possible to take the actual color card from the carrying case and insert it behind the printed plastic sheet covering the visualizer so that the exact color scheme of the complete room can be visualized. This most ingenious device completely does away with both guesswork and arguments. (*Please turn to next page*)

Front and reverse view of a color-matching acrylic sheet. Color is seen from the front, its formula number on the back. The user lays the sheet over the material to be matched or harmonized, picks the desired shade and turns the sheet over to ascertain its identity





An acrylic box is also offered to paint retailers who wish to make their color-matching set available for use by customers. This box holds 1000 color samples and is divided into sections by vinyl separators. In the photograph below, piano-type hinged lid of box is closed

When the retail operator also does custom decoration, he is provided with a Vinylite-treated carrying bag to slip over his elegant transparent acrylic color matching case.

How color system works

The whole system accomplishes seven main purposes: it reduces from over thirty to seven the number of colors held in stock by the store or the decorator. It sets up the simplest possible formula system for intermixing and also establishes a simple system for mixing color with white to get pastel shades. It prevents the accumulation of obsolete colors of paint and eliminates the possibility of popular shades being exhausted. It stops the need of time-taking experiments in blending and obviates the need for trying to match wet samples to dry harmonizing materials. This system also allows for the blending of both flat and shiny paints to the same exact match and it makes possible the matching of colors under the luminant which will be used after the paint has been applied.

For department stores this unique color system opens up even further possibilities. The store may be decorated with any number of the 1000 tones so each department—fabrics, furnishings, and all paintable surfaces—can become a merchandising element for the paint department. While this color plan is exclusive to the one line of paint manufactured by Martin Senour, it is broad enough in scope to fit in with the simplified color plans developed by the Grand Rapids Furniture Guild, House and Garden, the Institute of Carpet Manufacturers and many others.

Foss and Rahr are naturally enthusiastic about the Nu-Hue color program. Reports from decorators and paint merchandisers who have been given the opportunity to examine it, indicated that their excitement will easily match that of the originators. And it could not have been done so effectively without taking advantage of the weight, strength and transparent quality of plastic materials.

Phenolic control for electronic blanket

by DAVID MAXWELL*

JOHN Q. PUBLIC is surprisingly timid about buying radically new merchandise. So is his wife. Only the kids can take atoms and electrons in their stride. Because of this, a manufacturer introducing a household product which operates on a new principle, is well advised to make it look like something with which the average man and wife are acquainted.

The Simmons Company, well-known bedding manufacturer, recognized this rule in the development of its new electronic blanket, and our designers used it as the guiding principle in developing a molded phenolic control box or case for the product. Since the public associates electronics with radio, and radios with plastic cabinets, we decided that the housing should look like a small radio, yet be different enough so a sleepy knob-twister would not mistake a radio for the control box, or the other way around.

When the final model was perfected, it was a simple and functional housing of a style that would fit easily and pleasingly into the average bedroom. Instead of opening at the back, the case opens at the bottom—a construction that makes the unit tamper-proof and dustproof. The housing is 6 in. wide, 5 3/4 in. deep and has a maximum height of 3 1/2 inches. The vertical dial opening measures 7/8 by 2 1/4 inches. The twin knobs for controlling the unit are 3/4 in. in diameter.

Bridgeport Molded Products Co. is molding the housing and knobs of general-purpose Bakelite, the plastic interior assembly parts of medium impact material. Phenolic material was selected because of its availability, its price and its inherent stability. Color at present is limited to black.

Standard phenolic radio cabinet molding technique is used, but since we had tapered the design of the bottom to make the case look smaller, the molding job is more difficult than usual. The mold now parts 1/8 in. from the bottom of the case—the parting line being kept to a minimum and hidden by the curve above it. A side cam on the mold pulls out the block for the thermometer slot and the pins for the knob holes. Mold design is such that flow of material is no problem.

*Director of product development, J. Gordon Lippincott & Co.

PHOTOS, COURTESY J. LIPPINCOTT & CO.

Top—The molded phenolic control housing finally adopted for the electronic blanket is equipped with a vertical thermometer-type dial and two round control knobs

Left—The thought behind the design for the blanket control housing was that it should resemble the familiar radio case yet be different enough so that the two would not be confused

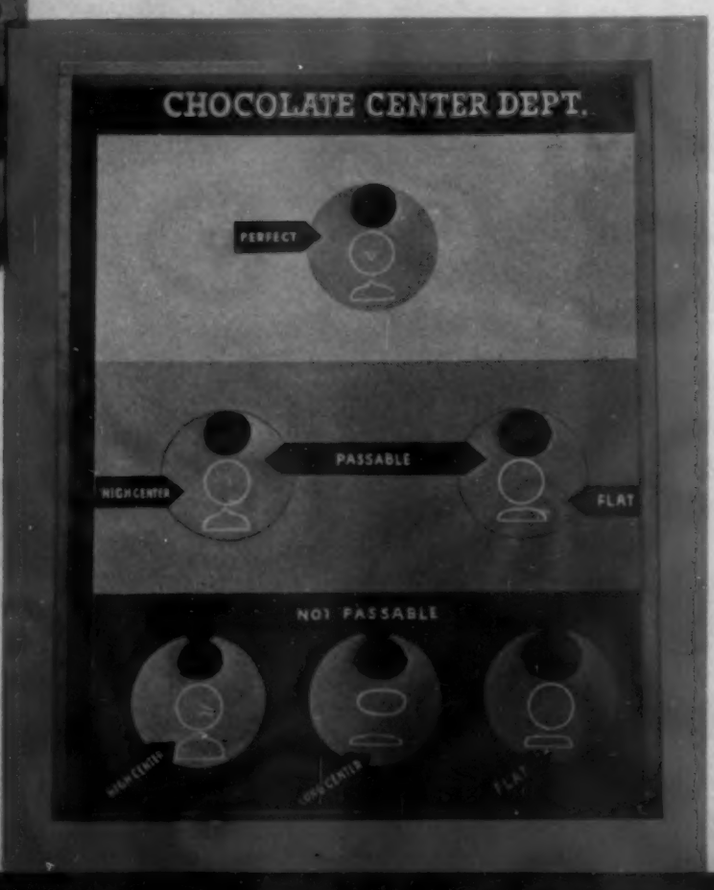
Cast resorcin used in CANDY replicas

A new means of controlling the quality of candy involves comparison of the product at each stage of its manufacture with replicas cast from resorcin

A SWITCH from hand operation or even from semi-automatic operation to completely mechanized production of any type of product necessitates the use of more automatic methods of quality control. In confectionery manufacture, where each step in processing is of such a critical nature that a mistake at any point can effect the quality of millions of candies, this rule is absolute.

M & M Limited, a big young company now producing huge quantities of multi-colored candy coated chocolates, has developed quality control based on a set of plastic replicas of its candies at every stage in the production cycle. Dr. Alfred D. Stern, process engineer of M & M, and Robert Brinkema of Egmont Arens, industrial design, collaborated in the creation of the replicas which were cast from an experimental resorcin casting resin developed by Pennsylvania Coal Products Co. A 2-piece plaster of Paris mold was used.

PHOTO, COURTESY M & M, LTD.



Above—Appearance is of great importance in such fields as that of confectionery. For this reason, plastic replicas have been developed to show how candy coated chocolates should look at each step in their manufacture

Right—The resorcin replicas of this candy, in this case the chocolate centers, were cast in two-piece plaster of Paris molds. These cast plastic replicas, which show all critical stages in the manufacture, are mounted on cards. Three complete sets were produced

The replicas are made up to exactly simulate the candies in various stages of manufacture, showing perfect, passable and non-passable samples. Mounted on colored cards, they are used by the inspection staff as a constant check on the candies in process.

In the manufacture of the M & M candies, the chocolate centers, made of pure milk chocolate, are automatically squeezed out of many orifices in a dropping machine and fall on to a moving belt. The chocolate must be of a definite viscosity. If it is too thin it falls down and gets limpid; if it is too thick, the centers will be conic in shape. In either case the pieces will not be usable in the next process. So the first two quality checking cards show perfect, passable and rejected replicas at the center stage.

Six replica cards check colored coating

Up to the point where the chocolate centers are covered with a candy coating made up in many colors the operation is continuous. Then it becomes a matter of batch control in which six different colors are used for coating. The colors of the candy covering must match a standard, and the color must be evenly distributed. There must be no holes, pits or scratches. Six cards with plastic replicas are used to provide the standards against which the color operation is judged.

The cards are in three sets: one set for the inspectors at the machines, one for the production department and one for management. Anything between perfect and passable is okayed and anything below passable is rejected. It is not a matter of segregating rejects from okayed candies. Since the operation is strictly automatic, the inspector knows that a certain percentage of non-passables on the conveyor belt in front of him means that further material will likewise be rejected, so he reports by phone from his station to the quality control lab, and steps are immediately taken to change the situation. At any stage the quality control lab has the authority to stop any machine or the whole plant, to remove and rework any non-passable batch of candy.

The why and how of resorcin replicas

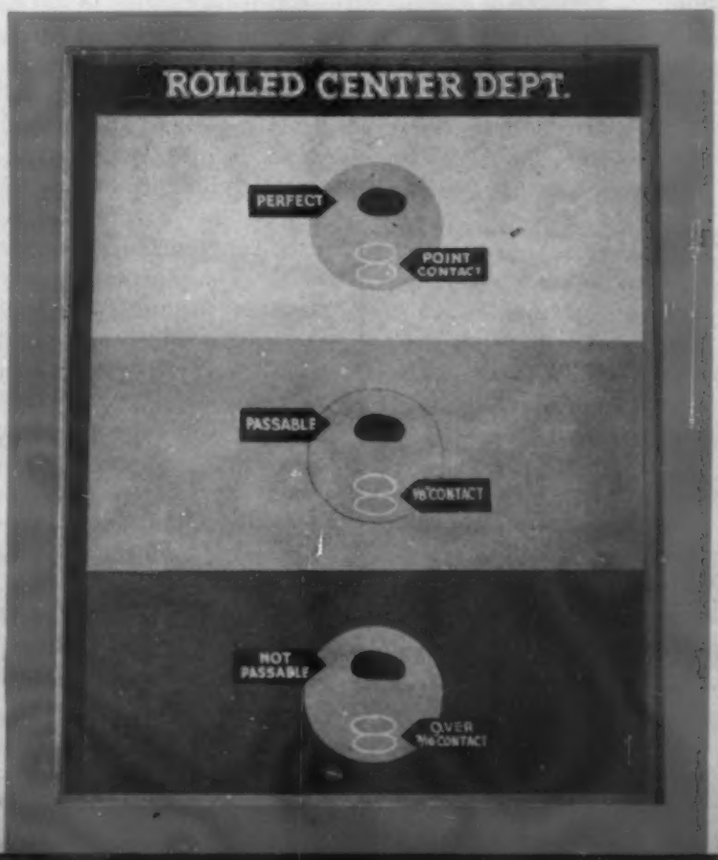
The reasons for using plastic for the construction of the models is an obvious one. Chocolate candy centers, if used without their final coating, would have deteriorated. Other materials would have been subject to temperature and humidity changes.

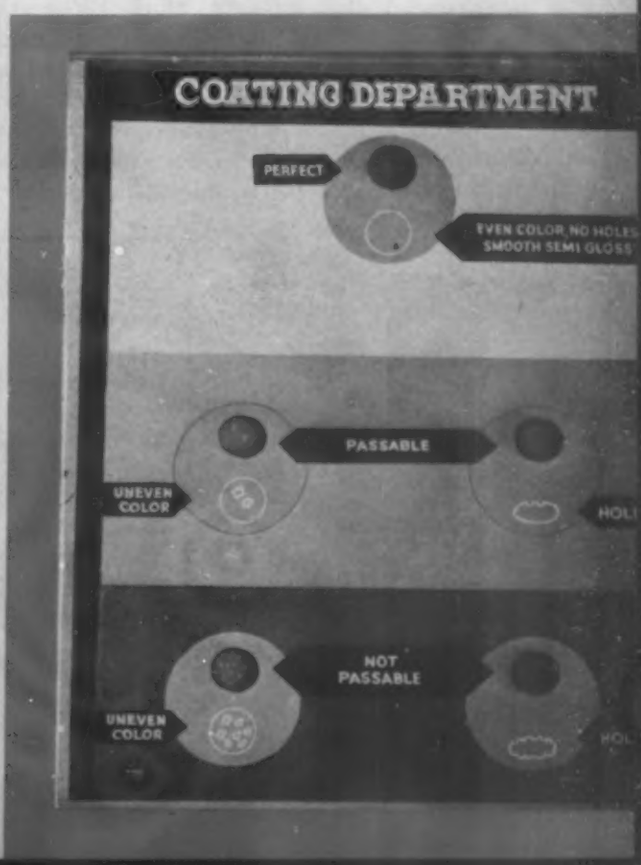
Since only a few hundred of each replica were required, normal molding procedures for thermoplastics and thermosetting or even for casting compounds were out of the question from the standpoint of cost. But plaster of Paris molds were simple to construct and to use. Once the resorcin resin mixture was modified to cast easily, the job went through with few hitches. ceresin wax was used as the parting agent and the pieces were cured in air at room temperature. Then coloring was applied to the replicas intended for color checking and the pieces mounted on inspection cards.

The originators of the technique suggest that it opens up a new field of replica reproduction, specially suitable for returning servicemen and those with small plastic production facilities and limited capital. Exact replicas of perishable items like candy, biscuits and cereals are needed for display as well as for quality control.

Each of these control cards shows the ideal candy at the top. In the center are represented the pieces that are passable. The bottom row indicates the candy to be rejected

As these candy coated chocolates are made in six different colors, it was necessary to cast enough resorcin replicas so that three sets of six each could be properly tinted





PHOTOS, COURTESY UNITED WALLPAPER, INC.

Wallpaper built on thermoplastics

IT was the use of thermoplastic resins with positive stainproof, greaseproof, mildewproof characteristics and other significant properties that made the new wall covering, Varlon, a reality. And it is these same resins that can be credited with the remarkable performance (as shown in the box below) chalked up by this wallpaper of United Wallpaper, Inc., in tests conducted by the United Testing Company.

Varlon is not a plastic-coated, nor a plastic-laminated paper. But it might be termed something close to a plastic-impregnated paper. As a result of the new manufacturing technique used to produce this wall covering, the company has been able to achieve—for the first time synthetically—decorative effects hitherto found only in very expensive and fragile hand-blocked wall coverings. The effect obtained simulates wood block printing done by the old masters. It is anticipated that a complete line of designs will be offered, each an original creation of a prominent designer and unique in that it will resemble hand-blocked papers in watercolor.

Paper or cloth is used as backing only for the convenience of hanging. Regular paperhanging technique can be used, the covering requiring no special equipment, tools or training. Paper-backed Varlon trims as easily and smoothly as ordinary wall coverings; and the cloth-backed type, while tougher, trims smooth and straight without tendency to pull or ravel at the edges. If desired, the paper or cloth that forms the backing can be rendered resistant to vermin, mildew and mold. This is not necessary, however, since this new wallpaper is applied to the wall with a special bonding solution which is resistant to these factors. This adhesive, during application, enters the paper rendering it waterproof.

According to reports, comparisons of Varlon-coated plaster panels with the same panels coated with flat and high-gloss enamel under typical conditions showed this new material

"Crisco was placed on the surface of Varlon samples in a number of spots and allowed to remain for 24 hours. After that time, the surface was wiped with a dry cloth and washed with soap and water. There was no evidence of staining or other visible effect."

"A sample of Varlon was mounted on a flat panel and set at an angle, face down. The flame from an alcohol lamp was placed beneath the wallpaper so that it impinged upon the surface. After 5 min. the material had not taken fire and it did not glow for more than 10 seconds."

to be equal to or better than the paint tests. In an impact resistance test no damage was done to the new coating except for slight scuff marks which were removed with soap and water. In contrast, on the painted surfaces there was either a scuffing which could not be removed or, in the high-gloss sample, an actual chipping of the paint down to the bare plaster.

The advantage of Varlon was shown in test comparing wallpaper with paint as far as repair of dented or marred surfaces is concerned. A hammer was brought to bear on both types of samples so as to crack and break the plaster underneath. The paper was removed, the loose plaster removed and the hole patched with plaster. A patch was then cut from the new thermoplastic material, care being taken that the pattern matched, and pasted in place to effect a neat repair. With paint, such repair is not feasible due to the difficulty of getting a smooth plaster patch and of matching the color of the paint.

The paper under test

Some of the extremes to which this new wallpaper has been found resistant include a temperature of 160° F. for 30 days without effect; sudden chilling to −50° F. without disintegration or other harmful effect; exposure to 100 percent humidity at 120° F. for 4 days; direct exposure to steam for 6 hours; exposure to salt air or water; exposure to accelerated light tests as in standard fadeometer test for 48 hours—equivalent to 6 years of normal use.

In a Tabor abrasion test, sets of panels were tested using No. C-17 abrasive wheel. Upon examination, both the flat and high gloss enamel were visibly abraded at 25 revolutions, whereas the plastic wallpaper began to appear abraded at 125.

The water-resistance of this paper is demonstrated by the fact that it shows no penetration through the surface in an area larger than a 50 cent piece after a 24-hr. test. Minimum tear resistance of the wallpaper is 40 in the machine direction, and 56 across, using an Elmendorf Tearing tester.

Samples were exposed to phenol, cod-liver oil and sour milk for 96 hr. at 120° F. and 95 percent R. H. With phenol and cod-liver oil there was only a very faint odor noticeable, and none with sour milk.

Some cautions must be exercised, however, in the treatment of this wallpaper. The use of carbon tetrachloride, gasoline, naphtha and abrasive cleaners is advised against, as is the use of such disinfectants as strong Lysol and phenolics, unless they are rinsed from the surface as soon as possible, and thoroughly, using soap and water. It will resist almost any amount of rubbing with soap and damp cloth, but care should be exercised in using turpentine. The latter does not require hard rubbing; the action of the solvent is enough.

Removal of chewing gum can be accomplished by removing the excess with a dull knife, dissolving the residue by wiping it gently with turpentine, then washing with soap and water. Meat juice, blood and Chlorox, even after being allowed to stand for half an hour, can be easily removed with double-strength Soilax.

From these facts, the appeal of this covering not only for homes but all types of institutional building and in various transport media is readily apparent. For the last 14 months it has been tried on the walls of eight private homes, six hotels, two hospitals, three restaurants, two office buildings and the women's lounge of a large Chicago theater.

The paper will be merchandised in 24-in. widths, packaged in units of 50 square feet. It will be marketed by Varlon, Inc., a new United Wallpaper subsidiary.

Top—Fadeometer test showed that this wallpaper did not fade after a 24-hour exposure at 38-46° C. and 50 percent relative humidity. Right—An alcohol burner placed ½ in. from sample did not cause paper to flame

Molded collapsible canoe

THE latest innovation in outdoor pleasure craft is a plastic sectional canoe which takes two of the all-time bugaboos out of such boats—weight and bulk. Because it is made in two easily assembled sections which pack compactly into two zippered bags, it can be stored in the luggage compartment of a car, ready to be taken anywhere. Its weight, only 65 lb., renders it portable to the most remote hideouts.

The Linkanoe, as it is called, is a standard-size guide canoe (14½ ft. long, 35-in. beam) manufactured by Link Aviation Devices, Inc. Being made of a cotton fabric base postforming material, its light weight was assured but not until the canoe was tested under trying circumstances was the company able to guarantee the strength and durability of the material.

For four years before reaching the market the Linkanoe underwent severe tests. During that time it was observed in some of the world's most rugged country—the interior of Canada. It was found to possess more than average strength, to be well balanced and able to carry a full load of passengers and equipment. (On several occasions it was used to transport large moose that had been bagged during hunting trips.) The canoe's maneuverability was tested in hazardous and rough waters and proved safe and easy to handle. In extensive portages through virgin brush it was not unwieldy. In addition, the plastic material of which it is made did not crack or split and remained waterproof and impervious to salt water, oil and gasoline.

During tests another unique characteristic of Linkanoe was discovered—the flexibility of its plastic body. Because of this characteristic the canoe will often flex back into shape after receiving a sharp blow.

In making the Linkanoe, the manufacturer uses a cotton fabric base which has been impregnated with a Bakelite phenol laminating resin. This impregnated material is then high-pressure laminated under 1500 p.s.i. in a hydraulic press. The various shaped sections of the canoe are formed by taking the resulting laminated sheet and postforming it at 40 p.s.i. pressure at 275° F. The finished material has the appearance of a natural hard wood and need never be refinished.

The wood frame, around the outside of which the sections of the hull fit, is made from strips of 1/16-in. birch veneer laminated together under a pressure of 80 p.s.i. The laminated sticks of wood are then put in jigs to be properly shaped. After setting, they are cut to the desired lengths.

The Linkanoe is furnished with a canvas sheath which fits closely around the assembled hull. The sheath, waterproofed by a special process, is held in place by elastic airplane shock cord.

Fishermen and sportsmen who are primarily interested in having a day's fun without too much fussing over equipment will be glad to know that the Linkanoe can be assembled in 10 min. without the aid of tools. A complete instruction book outlines the assembling process in a few simple steps: 1) take the sections out of their packs; 2) place them in the proper order according to the numbers stenciled on each section; 3) clamp them together; (specially designed metal clamps are used to lock the tongue and grooved joints together); 4) install seats, center thwart and decks; 5) turn canoe over and draw on the canvas sheath; 6)

hook the elastic cord attached to the hem of the sheath over the buttons around the outside rim of the canoe.

The paddles are also sectional and can be used to perform other duties besides manipulating the boat. When disassembled they are used as handles for carrying the packs. When assembled and fastened to the bow seat and the center thwart, they make a convenient yoke for carrying the craft overhead. For those who prefer other means of locomotion, the Linkanoe can be equipped with oars and oarlocks, a motor or a rudder.

Link Aviation Devices, Inc., with characteristic foresight, are prepared to replace, at nominal cost, any section or part of the Linkanoe which is lost or damaged.

New pleasure is added to canoeing by a sturdy, lightweight craft made of a cotton fabric base impregnated with phenol laminating resins. Its 10 molded sections, weighing 65 lb., are carried in two zippered bags (right). Assembling (below) and fitting the canoe into a water tight sheath is a simple process taking only 10 minutes

ALL PHOTOS COURTESY LINK AVIATION DEVICES, INC.

Light-directing acetate sheet displays

Vertical laminations of cellulose acetate having 23 louvers per inch are used to display clear merchandise to advantage

A PROBLEM which has always faced merchandisers in displaying crystal and acrylic products has recently been solved by the application of another plastic, cellulose acetate. Glass and acrylic have the ability to carry light from within and for that reason have always been a challenge to the display designer in that the best previous display fixtures were not able to bring out this quality and present the article to the public to best advantage. The only possible method of display seemed to be to arrange the acrylic or crystal products against a dead black background, the only light showing being in the products themselves. But this of course brought out but little of the inherent beauty of the materials.

With the introduction of Louverplas, this display problem which faced so many merchants was solved. And now a new formulation of these patented light-directing sheets of laminated cellulose acetate has been developed by the Doane Products Corporation, Plastacele being the plastic used to perform this new feat of display. The display material consists of a vertical lamination of cellulose acetate available in various thicknesses, having 23 black louvers per inch. These louvers, which appear to be thin black lines, are actually as wide as the material is thick—running completely through the piece of transparent sheet. Light will go directly through Louverplas, but, viewed from an angle

Black light applied to plastic signs

Striking effects can be created by the focusing of black light on fluorescent-treated sheets of acrylic and acetate

COMMON problems in lighted signs for shop windows, store interiors and functional uses, such as exit markers, have always revolved around the weight of the fixtures, limitations in color and cost of operation. Surplus light has also been troublesome.

Through the application of plastics, J. M. Gordon, research specialist in black light and luminescence, has largely overcome these problems. The principles on which Mr. Gordon's new fixture developments are based are two: first, that some plastics will pipe light; second, that this piping may be used in conjunction with ultra-violet radiation created by black light focused on plastic impregnated with fluorescent pigments.

A filter tube of Tenite II used to cover a low-wattage fluorescent lamp to provide the black light is standard in the fixtures shown here.

The first fixture is a portable black light display for shop window and store counter use. It provides a three-dimensional and three-or-four color effect in fluorescent plastic letters, similar to a miniature neon tube in brilliance but square in tubular cross section.

The base box is drawn from black Lumarith and a metal reinforcement and contact bar is cemented into the bottom of it, along with the end sockets for the lamp—the electric cord coming out of a hole at one end. The fluorescent lamp with its ultra-violet filter is then slipped into the sockets. Across the top at the back

of 30° or greater, the laminated plastic sheet appears to be solid black.

In displaying crystal, glass and acrylic products using this new plastic formulation, an enclosed cabinet or window space is used—the interior of which is entirely finished in dull black. Hidden in the top and bottom of the display case are two low-wattage fluorescent lighting fixtures. The bottom light is placed under a sheet of the black-lined Louverplas.

The products to be displayed are placed on a piece of glass that rests on the surface of the laminated sheet of cellulose acetate to protect it from abrasion by the articles on display. To the observer who stands a few feet from the miniature show window and looks at a downward angle on the Louverplas, the sheet appears to be solid black. But actually the light is being admitted through the transparent parts of the material, as well as the glass, and lights objects from the bottom.

The lower picture at right shows the objects lighted from the bottom only. The upper pictures show top lighting only. It can be seen that the method of lighting from the top is softer with fewer sharp contrasts. The lights are used in conjunction only when the displayed items have metallic parts or tops which could not be seen effectively if only lighted from the bottom. For one-material merchandise, however, the bottom light is generally found sufficient.

edge of the fixture is an acetate frame into which can be slid individual letters made of Lumarith and fluorescent treated in three or four colors. The black light at the bottom of these letters is carried up through them, producing the effect illustrated.

Since the fluorescent light does not throw off heat, the unit needs no ventilation. It is so strong that it may be turned upside down for use as a ceiling unit. It weighs but a fraction of a similar product made of even the lightest metal, and it costs from one-third to one-half as much. It uses one 15-watt fluorescent lamp to provide the same brilliance as produced by neon high voltage tubing bulbs.

The second fixture is designed as an exit marker for theaters. This unit has a light metal frame and uses a Lucite sheet with red luminescent letters stenciled on both sides and the rest of the sheet masked out. Across the bottom of the fixture is a strip of acetate dyed in a green fluorescent pigment to throw some light on the floor below the signs.

The advantages of this application for theaters are many. It is light in weight, economical to install and operate, completely uniform in glow, gives off no glare.

According to the designer, wider markets for the use of this principle can be expected in mural decoration, domestic and commercial decorative illumination and in functional units for industry.

ANIMATION in a molded toy

ALTHOUGH the sturdiness, cleanliness, wide color range and other desirable features of plastic materials are bringing about a steady increase in their use in the toy field,[1] it isn't very often that a new toy like Happo the clown comes along. Happo has character, color and action—including a quota of facial mobility that puts the rubber man in the circus to shame. And he's all plastic except for the pull string, being assembled from 18 cellulose acetate or cellulose acetate butyrate parts.

As Happo runs along on big revolving wheels that serve as his ears, his pointed cap whirls merrily, his mouth opens and closes, and his big eyes roll intriguingly. No matter how soiled he may become in his trips across the carpet, a damp cloth soon has him looking as bright and clean as ever.

Happo is molded by Michigan Molded Plastics, Inc., and assembled by Cinderella Manufacturing Co., which distributes the toy through customary trade channels. Standing $4^{5}/_{8}$ in. high and measuring $3^{1}/_{4}$ in. from ear to ear, he is a creation of Frank Woditsch, a celebrated toy designer who has spent many years in developing all-plastic toys of various types. Mr. Woditsch believes that plastic is an ideal toy material because of its durability, permanent color, resistance to chipping and freedom from rusting.

In order to obtain sufficient flexibility and resiliency to meet the rough-and-tumble play habits of youngsters, the molder specified Lumarith, Tenite or Tenite II for all parts of this pull toy. The 18 plastic components comprising Happo, ranging from large face and head sections down to tiny eye pieces, slip together quickly and easily. Acetone is used to cement parts together.

Combination injection molds are used for the unique toy in order to expedite production of the parts and satisfy a child's idea of how a circus clown should look.

[1] "Time to play," MODERN PLASTICS 23, 95–101 (Dec. 1945).

Eighteen cellulose acetate and cellulose acetate butyrate molded parts make up this colorful clown, Happo by name, whose rolling eyes, whirling cap and moving mouth would fascinate any child. Because he has durability, permanent color and won't rust or chip, he likewise comes under the heading of "practical"

Six different plastics combine to make this low-pressure molded laminated sandwich structure bag

Molded Luggage

FOR years the plastics industry has been fully cognizant of the immense market there is for luggage. The possibilities for plastics in this field has been intensely investigated, especially by the low pressure group. Many prototype bags have been produced by laboratory methods. Many have been displayed in various plastics shows, some companies gaining questionable publicity by demonstrating the strength, abrasion resistance, lightness and other good qualities of their product. But until today, there has always been one big stumbling block—cost—to the use of plastics for this purpose. The industry seemed unable to produce luggage at a price which would make it saleable in sufficient quantity to warrant the cost involved in tooling up for large-scale production.

Luggage made from aluminum and plastic honeycomb core sandwich material was found to give a very satisfactory performance. Traveling bags molded from impregnated fabrics by low-pressure or contact methods were also satisfactory except for weight which was excessive. In every case, however, production costs eliminated the plastic pieces from the highly competitive luggage field.

Six materials form the answer

Now the picture has changed, for within the last few months the Foreval Plastics Co. has combined its knowledge of plastics with the overall knowledge of the luggage field possessed by the Algene Manufacturing Company. This pooling of information has resulted in the large-scale production of a set of plastic traveling bags which will, undoubtedly, because of their durability and eye appeal, find a market in the highly competitive luggage field.

Even before this new luggage reached the design stage it became apparent that the solution to the problems involved in putting plastics into luggage lay in the use of many *different* plastics, and results have borne out this belief. As finally worked out, this luggage employs more types of plastics than have ever before been used in a single article—6 different materials produced by 4 different companies being needed to mold a satisfactory bag.

The core for the sandwich structure is expanded cellulose acetate, produced by E. I. du Pont de Nemours & Co., Incorporated. The inside skin and one outside skin are Fiberglas cloth, a product of Owens-Corning Fiberglas Company. The second outside skin is a glass fiber mat produced in various colors by the Glass Floss Company. The adhesive used in gluing the strips of the sandwich is a Bakelite urea-formaldehyde resin, while the resin used to impregnate the glass cloth and glass floss skins is a styrene copolymer made by the Bakelite Corporation. The vinyl chloride used for bumpers and scuff corners is also a Bakelite product.

Even with the material problem out of the way,

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many weeks were spent in developing a satisfactory production system and solving the various difficulties that always attend the start of any operation. One problem involved the elimination of the show-through of the glue lines between the sections of expanded core material. This line was very obvious at first, due to the translucency of the glass fiber used for the skins of the traveling bags. The solution lay in the use of a transparent urea-formaldehyde adhesive.

Then, in developing the proper technique for impregnating the skin materials, further difficulties had to be overcome. There were the questions of the correct temperature of the resin, of the control of resin pickup, of the short life of the resin after the catalyst has been added. As for the fabricating technique, even the methods presently in use are subject to constant scrutiny. Daily this low-pressure molder is on the watch for new techniques he can try out. It may even be that by the time this article is in print many of the steps in the fabrication of the bags, perhaps all of them, will have been changed.

Assembling the bag—piece by piece

The expanded cellulose acetate core, the base around which each piece of luggage is built, is shipped to the molder in long strips which are $3\frac{1}{2}$ in. wide. Four of these strips, cut to 11-ft. lengths, are edge glued to make a sheet of material 14 in. wide and 11 ft. long. Since these traveling bags have rounded corners, separate lengths of the core material have next to be milled to a size and shape corresponding to these curved

2—Bodies of the bag and lid are constructed from sandwich structure with a core of expanded cellulose acetate, and glass fiber cloth and glass floss skins. 3—Flexible extruded vinyl, designed with two channels at right angles to each other, is employed in assembling ends of the luggage to bottom and top sections. 4—After the core material has been cut and glued to form a U-shaped channel structure—one of the first steps in the making of the bag—it is placed on a wooden form

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corners. Eleven-foot lengths of these specially rounded sections of core material are then glued on the outside edges of the 14 in. by 11 ft. sheet of expanded cellulose acetate. Additional sections of core material are glued along the long sides of the big sheet to form a U-shaped channel structure made up entirely of core material. Then, as soon as all glue lines have been set up, the U-shaped core is placed on a wooden male form.

The impregnating of the skins which form a cover for the expanded cellulose acetate—the next operation in the production of this all-plastic luggage—is carried out in a rather unique manner. A layer of glass floss is placed on top of a layer of glass cloth; then a second layer of glass cloth is placed on top of the glass floss. All three layers, laid up in this manner, are carried through a bath of resin, then through rollers that squeeze out the excess resin.

This done, one layer of glass floss and one of glass cloth are draped over the core material. The glass cloth is placed in contact with the core material, leaving the floss exposed. The glass floss surface is covered with a layer of cellophane and the entire assembly removed from the form and placed in a channel-shaped steel mold, the cellophane serving to separate the skin from the metal mold.

The remaining layer of glass cloth is laid over the exposed core material on the inside of the form. Again cellophane is used to cover the resin-impregnated skin material. Next comes a rubber blanket which is so placed that it covers the entire assembly. With the edges of the blanket securely clamped to the steel channel mold, a vacuum exhausts all the air from the

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5—With the skins for this luggage properly impregnated with resin, the outside covering is placed over the expanded cellulose core already in place on a form. 6—After a cellophane layer has been laid over outer skin, the layup is inverted and the inside skin laid in place. Again cellophane is used to cover the surface. 7—Covered with a rubber blanket from which all air has been exhausted, the 11-ft assembly is removed to an autoclave for curing at 230°F. and a pressure of 30 p.s.i.

5 ALL PHOTOS, COURTESY FOREVAL PLASTICS CO.

layup. The air removed, the rubber blanket acts to press the various components tightly against the mold.

In this state, the mold and layup are wheeled into an autoclave where steam under a pressure of 30 p.s.i. produces a temperature of 230° F. It takes approximately 20 min. under these conditions to produce a completely bonded and cured sandwich.

Once the sandwich structure is out of its channel-shaped steel mold, a cut-off wheel cuts the 11-ft. length of sandwich structure into six equal parts, 21 in. long. Each of these pieces comprises one half of a hand bag. Two different molds are used for the top and bottom of the bags—the only difference being the height of the sides of the channel. The sides for the bottom of the bags are approximately 4 in. high, the sides for the top about $2^1/_8$ inches. The edges at the ends of each of these 21-in. sections that make up one half of a bag are bevelled to a 45° angle so that sheets of the same type of sandwich as comprise the rest of the assembly can be machined to mate at the open ends.

A very flexible vinyl chloride extrusion[1] is employed in assembling these ends to the channel-shaped bodies of the bags. This extrusion is designed with two channels at right angles to each other to accommodate the edges of the two sections of sandwich material. A vinyl adhesive is used to hold the sandwich sections in place in the extruded joint.

The extrusion is coated with the adhesive and colored as desired. At the same time a coat of the same adhesive is applied to the sections of the sandwich which are to be assembled. The sides of the bag are then assembled into their correct positions and a permanent bond is achieved.

This extruded section not only acts to assemble the two ends of the bag to the channel section, but it also provides a scuff-proof bumper corner for the finished article. Thus assembled, the two halves of the bag are shipped to the luggage manufacturer who completes the job by assembling the hinges, lining the inside of the bag and adding the fittings and hardware.

Core material for the handle, too

The handle of this piece of luggage deserves special notice. Molded in a metal die, it is made from glass floss and glass cloth skins, with a core of expanded cellulose acetate.[1] This core is preformed, then covered with the impregnated skins which are colored to match the bags. This layup is placed in what amounts to a regular compression mold. The assembly holes are drilled in the strong and lightweight handle after molding.

The final weight of this luggage which is being merchandised by the Algene Manufacturing Co., is $5^1/_2$ pounds. But it is not only its light weight that justifies the attention which this bag will no doubt attract. The luggage also has eye appeal, due in part to the unique pattern provided by the glass floss outer layer, and a terrific bursting strength and abrasion resistance. Taken all in all these qualities mean a piece of luggage which is far superior to many traveling bags now on the market.

[1] This process is a development of Foreval Plastics Co., Patents are pending.

New polyvinyl type resin

The Glenn L. Martin Company, aircraft manufacturer, for the past three and a half years heavily engaged in plastic and chemical research, now announces its formal entry into the synthetic resin field. Their new products known as Marvinol type polyvinyl resins are compounded with various plasticizers and other ingredients. They vary from a rigid state to a rubbery state in the final product of their use, and are declared to have excellent chemical resistance, elastomeric advantages, unusual wearability, light and heat stability and excellent color qualities.

Applications for this resin

Marvinol resin-coated fabrics have been used for wall and floor coverings and upholstery in the new Martin airliners. Other resins of this type will be used by the company in the manufacture of electrical insulation for planes, door latches, bumpers, gaskets, washers, control knobs and instrument covers. Experimental work in the company's laboratories has produced from the resins a decorative and scuff-proof finish for new honeycomb plastic-sandwich flooring, a structural material used in Martin planes.

Both supported and unsupported film

Supported or unsupported, the resins are expected to find a market in the manufacture of colored wire, insulation, transparent garden hose, hospital sheeting, woven fabrics, handbags, balloons, industrial gloves, heels and soles for shoes, food packaging, raincoats, and many other products.

The company will offer these vinyl type polymer resins in granular white powder form, and will sell only to fabricators and convertors who will produce the compounds which can be used for molding, extruding, calendaring, or laminating by the industry.

Modified polystyrene molding powder

A STYRENE copolymer, which has been modified to combine higher heat resistance, greater strength, improved machining qualities and better weathering characteristics with many of the excellent properties already demonstrated by styrene polymers, has been announced by Rohm & Haas Company. Called Plexene[1] M, this powder is a thermoplastic, easily molded in commercial injection presses. A complete tabulation of its properties is given in Table I.

Odorless and tasteless, the material is a light amber color in its natural state. It is available, however, in translucent and opaque colors ranging from ivory to black. At present, the material is being produced in limited quantities, but it is anticipated that expansion of production will bring increased quantities into the market in the latter half of 1946.

As its A.S.T.M. flow temperature of 145 ± 5° C. (293 ± 9° F.) indicates, this styrene copolymer requires slightly higher cylinder temperatures than conventional styrene formulations. Present indications are that the best results are to be obtained in the 430 to 480° F. range, using medium to high molding pressures.

Plexene's heat distortion temperature of 89° C. is higher than that of heat-resistant Plexiglas H, which is set at 75° C.

[1] Plexene is a trade mark, registered U. S. Patent Office.

Table I.—Properties of Plexene M Molding Powder

Property	*Data*	*Test method*
Specific gravity	1.08	A.S.T.M. D 71–27
Tensile strength, p.s.i.		A.S.T.M. D 638–42 T
1/8 in. maximum	10,000	
1/8 in. rupture	10,000	
1/4 in. maximum	10,000	
1/4 in. rupture	10,000	
Flexural strength		A.S.T.M. D 650–41 T
Maximum, p.s.i.	16,000	
Rupture, p.s.i.	16,000	
Mod. elasticity, p.s.i.	500,000	
Deflection, in.	0.2	
Comp. strength, p.s.i.	15,000	A.S.T.M. D 695–42 T
Impact strength, ft./lb.		A.S.T.M. D 256–41 T
Unnotched (1/2 by 1/2-in. section)	3.2	
Notched (per in. molded notch)	1.0	
Heat distortion		A.S.T.M. D 648–45 T
1/2° C./min., 264 p.s.i.	85° C.	
2° C./min., 264 p.s.i.	90° C.	
2° C./min., 66 p.s.i.	102° C.	
Flow temperature, at 1500 p.s.i.	145 ± 5° C.	A.S.T.M. D 569–43
Shrinkage of injection molded bar		Air oven heating
2 hr. at 80° C.	0.2 mil per in.	
2 hr. at 100° C.	6.0 mil per in.	
Rockwell number, 1/4 in. ball, 100 kg.	M 77	R & H P-20[a]
Abrasion resistance, percent CS 10/500 g., 25 revs.	11	LP-406*a*-1092
	As received / *Accelerated aging, 24 hr.*	
Light transmission, %		A.S.T.M. D 672–42 T
Parallel	49 / 39	
Total white	57 / 44	
Haze	15 / 11	
Accelerated weathering		LP-406*a*-6021 (200 hr.)
Crazing, Discoloration, Warping, Unmolding		None
Dielectric strength at 25° C. (77° F.), short time test volts/mil	350 ± 25	A.S.T.M. D 149–40 T

Property	*Data*	*Test method*
Dielectric constant at 25° C. (77° F.)		A.S.T.M. D 150–42 T
60 cycles	3.0 ± 0.3	
1000 cycles	3.0 ± 0.3	
1,000,000 cycles	3.0 ± 0.3	
Power factor at 25° C. (77° F.), percent		A.S.T.M. D 150–42 T
60 cycles	1.0 ± 0.3	
1000 cycles	0.8 ± 0.3	
1,000,000 cycles	1.0 ± 0.3	
Arc resistance, sec.	140 ± 10	A.S.T.M. D 495–42
Loss factor		A.S.T.M. D 150–42 T
60 cycles	0.17 to 0.23	
1000 cycles	0.16 to 0.21	
1,000,000 cycles	0.06 to 0.09	
Burning rate	Slow	
Odor	None	
Resistance to chemical reagents, percent weight change after 7 days at 25° C. (77° F.) immersion in:		A.S.T.M. D 543–41 T (A change in weight of 1 percent or less is considered negligible)
Sulfuric acid, 30%	0.19	
Sulfuric acid, 3%	0.36	
Nitric acid, 10%	0.34	
Hydrochloric acid, 10%	0.27	
Acetic acid, 5%	0.35	
Oleic acid	0.02	
Sodium hydroxide, 10%	0.30	
Sodium hydroxide, 1%	0.36	
Ammonium hydroxide, 10%	0.41	
Sodium carbonate, 2%	0.33	
Sodium chloride, 10%	0.32	
Hydrogen peroxide, 3%	0.37	
Distilled water	0.37	
Ethyl alcohol, 50%	0.38	
Ethyl alcohol, 95%	0.65	
Acetone	Dissolved	
Ethyl acetate	Dissolved	
Ethylene dichloride	Dissolved	
Carbon tetrachloride	0.30	
Toluene	Dissolved	
Gasoline (heptane)	0.20	

[a] See "Plexiglas—Mechanical Properties," published by Rohm & Haas Co.

Spray coatings for heavy-duty packaging

A vinyl resin solution, to which a webbing agent, polyvinyl chloride has been added, is proving its worth in the packaging of Navy equipment

REMEMBER the wholesale scrapping of ships after the last war? Well, ships whose guns had been pointed toward Kwajalein and Luzon, Salerno and "Omaha" Beach in this war, are not destined for the same fate. Instead, in the current decommissioning program of the East Coast's Sixteenth Fleet and the West Coast's Nineteenth Fleet, over two thousand units of the U. S. Navy are being "packaged" in plastics to protect them against time and the elements. The broad scope of this naval program, the size of the equipment being packaged, forecast the many potentialities of these materials for the packaging of consumer and industrial products.

With the cessation of hostilities, the Navy was faced with the problem of having to store away those ships not needed for such peacetime use as patrol duty or policing operations while preserving essential equipment so that it would be ready for active duty on a minimum of notice.

Conventional methods of protecting inactive but exposed equipment aboard Navy ships were found to be inefficient, frequently rendering costly apparatus unserviceable in a relatively short period of time. What the Navy needed was an entirely different method of packaging this equipment—an economical method which would insure the maximum in moisture protection for ordnance equipment to prevent corrosion and deterioration, and enable quick and easy removal.

The packaging process, developed by Dr. William H. Holst and G. Russell Hersam of Butler and Co. which met this demand, provided an easily strippable coating based on Vinylite resins. During a visit to the plants of the R. M. Hollingshead Corp., who manufactures this coating, a demonstration was given of the technique involved. For application this coating requires nothing more than a supply of air and spray guns, the quantity of the latter depending on the size and number of the packages to be covered. During the last quarter of 1945, the Navy procured over one million gallons of this solution for the spray coating of various types of equipment.

The system begins with a framework of pressure sensitive tape built up around the object to be sealed. The spraying operation then applied to this skeletal frame consists of four steps, developed in the following order:

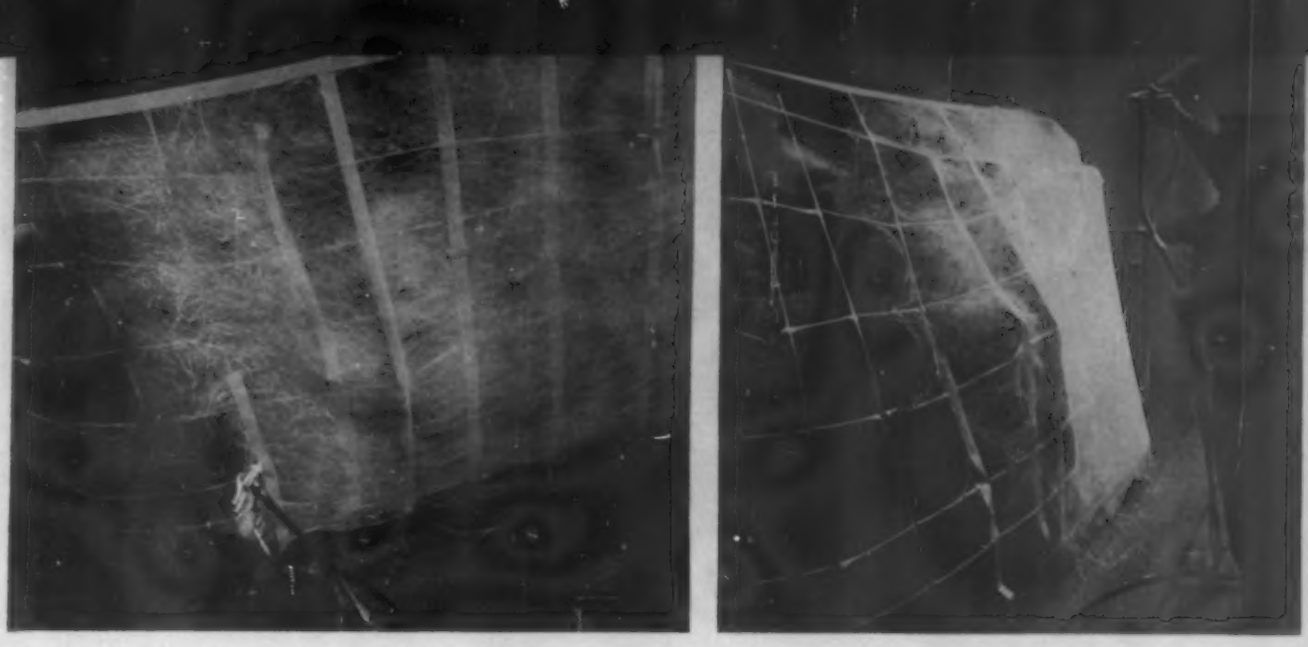
1. *Application of the webbing solution*—This is a vinyl resin solution to which a webbing agent, Saran, has been added to produce filaments emitted from a standard spray gun. These filaments are extruded in a cobweb-like form. They bridge over, but do *not* adhere, to the surfaces with which they come into contact. The web is built up to a point where sufficient strength is obtained to permit the application of the second coating.

2. *Moisture barrier*—This second coating is a solution of Vinylite resins with webbing agent omitted. Vinyl resins are main film-forming constituents and are suitably plasticized with rust-inhibitors. Thisc oating is built up in a continuous operation with standard spray guns and equipment to a film thickness that will give the desired strength plus low moisture vapor transmission characteristics. To complete the package a top coating is then applied.

3. *A pigmented vinyl resin topcoat*—The purpose

A coating based on vinyl resins is the answer the Navy found to its need for an economical, long-wearing, easily and quickly removable packaging material for large heavy equipment

ALL PHOTOS, COURTESY BAKELITE CORP.



The first step in the application of this coating is the spraying on of a webbing solution, comprising vinyl resin to which a webbing agent, polyrinylidene chloride, has been added. This is followed by a second, a moisture barrier, vinyl coating. Then comes a top coating

of the pigmentation is to inhibit the deleterious effects of the sun's rays as well as protect against general weathering conditions. This step is required only for long-term outdoor storage. Although any color can be added to the solution, a specially developed pigment has been found which provides the best weathering characteristics.

Should it be required, a special adhesive is applied where it has been found necessary to seal the package to the equipment.

4. *A desiccant is added*—Regardless of whether a top coating is added, the final step in this packaging is the evacuation of air and solvent fumes by the use of a hot air blower which dries out the air and rids the package's interior of fumes given off by the solvent. Into the openings cut to exhaust air from the package, desiccants are placed in a predetermined quantity depending on the length of storage required. The openings are then sealed with the top-coating solution.

Advantages of process

It will be seen that the applications of this process are limited only by the ingenuity of the users. However, among the more outstanding benefits to be gained by the spray-coating method are:

1. No predesigned form and no prefabrication is needed. The coating can cover anything from a single ball-bearing to a locomotive with the same equipment and process. The whole job can be performed with a resin solution, a supply of air and, in certain cases, only one spray gun.

2. The process is capable of encasing large irregular shaped equipment that is difficult to handle and can be used where ordinary packaging methods would prove too cumbersome or unwieldy.

3. The process eliminates the necessity of dismantling equipment for storage. Formerly, the Navy had to remove whole guns and take them apart, piece by piece—an operation which required months to complete. Under this system the entire gun or mechanism is sealed in. Then, when called upon for action, the gun or equipment can be completely stripped of its coating and ready to operate in 5 minutes.

4. In terms of cost for packaging of equipment, this process is relatively inexpensive, when compared to the elaborate prefabricated packages which are classified as permanent storage units. Costs of large metal containers, for example, run in the thousands of dollars, while expenditures for this new spraying process can be held in the hundreds.

Properties of coating

The applied vinyl resin film has a tensile strength of 2000 p.s.i., which is stronger than the inner tubes used in automobile tires, and it has an elongation at room temperatures of 200 percent. It will not soften or become tacky at +180° F., and is capable of being bent double over a $^1/_8$-in. bar at −40° F. The film's moisture-vapor transmission rate is approximately 0.15 gram per 100 sq. in. for 24 hr. at a vapor pressure differential of 42 mm. mercury. The latter, it will be noted, is in the lowest range of moisture-vapor transmission of all organic films with the equivalent strength characteristics. Especially advantageous and highly important from a marine standpoint is the fact that this new resin spray coating is both fungistatic and bacteriostatic.

These properties indicate the extreme toughness of the coating. In the future, they will make possible strong preserving packages from a spray gun. Refrigerators, washing machines, farm equipment, tractors, hydraulic presses, outboard motors and many other types of household and industrial equipment can be stored or shipped safely under any climatic conditions—completely encased in what might be termed cartons of vinyl resin base spray coatings.

A NEW note of realism has been added to "the battle of the playground" with the colorful new all-plastic toy model of a "Handie Talkie" which Galvin Manufacturing Corp. has recently brought out. This plastic toy closely duplicates in appearance the original Motorola unit which carried our front-line communications right into the teeth of the enemy on both the European and Pacific fronts all during the entire war.

Parts for this interesting new toy are injection molded by Gits Molding Corp. and assembled by the manufacturer. The material employed is cellulose acetate with red, white and blue components permitting the use of several different color combinations in the finished communications unit and making a colorful patriotic plaything.

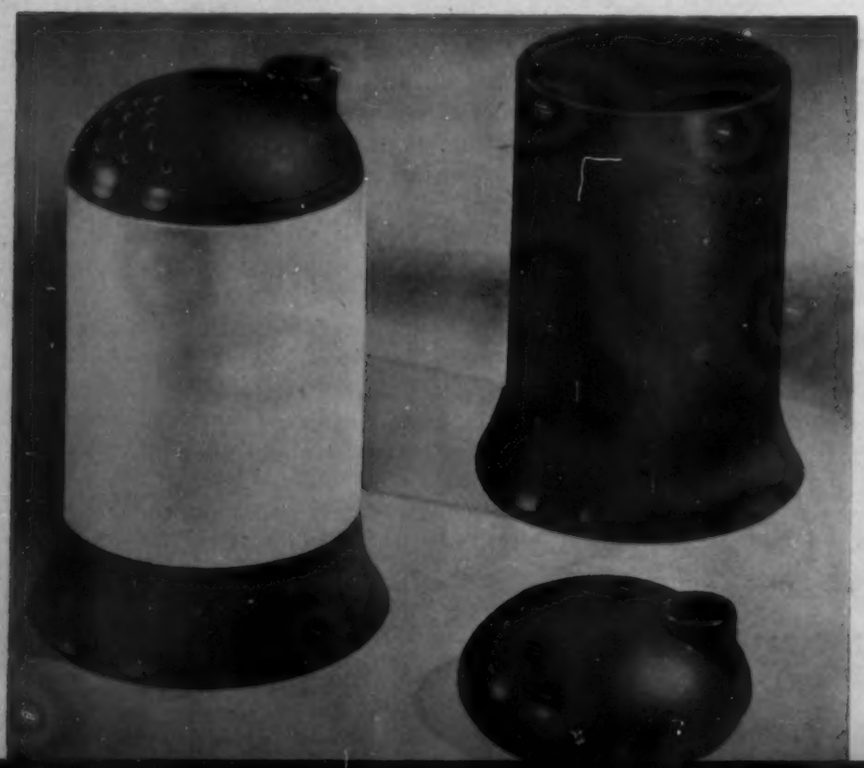
One mold is used to form the barrel section, while another simultaneously forms the top, bottom, ear and mouth piece and the ball which tops the extensible aerial rod. In order to facilitate the problem of fabrication, the components were designed with projecting flanges which are dipped into a tray of acetate cement, making it possible to fasten the parts together firmly without smearing cement over a wide area. Assembly flanges, however, are definitely not visible in the Handie Talkie toy unit, once it has been completely assembled and finished.

The canvas hand-strap is assembled when top and bottom sections of the toy are glued in position. The plastic ball is driven tightly onto the metal serial rod, the opposite end being so designed that it will not pull through the boss at top. In addition, a spring clip on the rod holds it securely in several different positions.

Creating further interest for make-believe soldiers are a blinker device for flashing code messages and a loud siren fitted in the mouthpiece which howls an alarm which is almost certain to cower the cruelest and most relentless of imaginary enemies.

PLASTICS PRODUCTS*

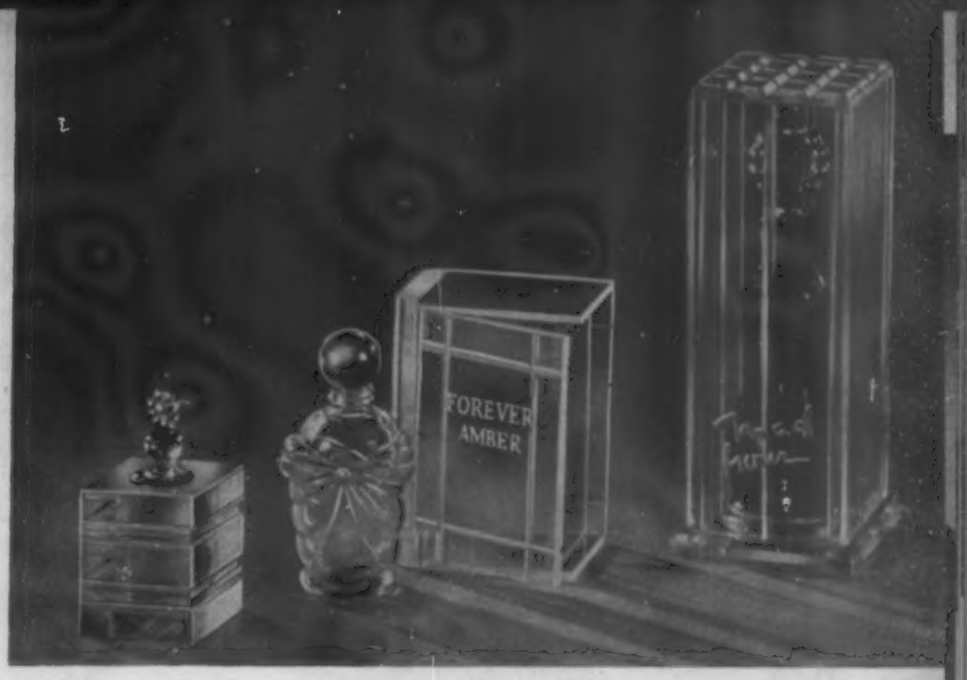
UTILITARIAN to the *n*th degree, this cellulose acetate dispenser has a spot for pouring, holes for sprinkling, is suitable as a container for such household commodities as salt, sugar, flour, granulated soap or cleansing powder. Plastics Molded Products is the distributor of this item.



Although for all practical purposes the container is in two pieces—body and removable threaded top—actually it is injection molded in three parts, the base being permanently cemented to the barrel or middle section assembly. Plastic Die & Tool Corp., the manufacturer, uses a six-cavity die on a 16-oz. machine to injection mold the dispenser from Tenite. The only difficulty encountered was with trapped air which caused burns in the lowest of the molded sections. This was overcome by ribbing the bottom to provide a more even and free flow of resin.

In red, blue, ivory or two-tone combinations, the dispensers help to brighten up the drabbest kitchen.

Plastic with its smooth finish, comfortable feel and clean appearance is ideal for the kitchen. Better than wood from the standpoint of manufacturing economy, better than metal for its rust-proof quality, plastic was best for this application on all counts.



WHEN Kay Daumit introduced her perfume, Forever Amber, on the market she wanted the package to live up to its name and tie-in with the bestseller. Robert Van Rosen of Donmak Creations took over the assignment and designed a Lucite box which is made to look like and open like a book. It is simply constructed of methyl methacrylic sheets and carries the name Forever Amber silk screened in gold on the front cover. The cover, actually the door to the box, swings on metal pins and has a snap spring closing. This unique closing feature is brought about merely by having a square edge on the hinge side of the door instead of a rounded one.

Forever Amber's other container (left) is machined from a cube, comprising layers of methyl methacrylate laminated under heat and pressure with alternating thin layers of colored matter. A hole is drilled in the center to hold the perfume bottle. Due to the light-piping characteristics of the material the color is reflected through the container and gives it an all-over amber appearance.

Henry Rosenfeld's Mad Hour container is also a Donmak creation fabricated from Lucite. It is the first plastic telescope box that the perfume industry has used and it was important that it be made with great precision. To give the container interesting light-catching possibilities the sides of the cover are grooved on the inside and the top is grooved on the outside.

PLASTICS PRODUCTS*

* Registered U. S. Patent office

A GEON fly swatter that will not only kill flies, but also spray a pleasant odor through the room and serve as a bottle opener as well has been devised by Odor-Swat.

Convinced that it was time for the conventional swatters of wire mesh and rubber to be supplanted with something better, the company sought the advice of a plastics material manufacturer and emerged with the idea of bringing vinyl chloride to this application. Once a molding process was developed by the Plastic Engineering Co., a set of tests was run which consisted of beating the plastic swatter continually for two weeks by means of a motorized attachment. At the end of this time there were still no visible signs of fatigue or wear on the vinyl material.

Careful thought was given to the design of the swatter. Finally by making the surface ribbed an action was obtained which minimized the "squashing" of the fly. The swatter is unusually sanitary as it can be washed in soap and water. Unlike metal, the vinyl does not rust from contact with water nor fray from hard use; unlike rubber, it withstands the heat of the kitchen in the summertime.

Also of plastic is the handle which is extruded Tenite tubing. Besides its obvious use, this handle serves as a container for basic scented oils which give off an agreeable odor whenever the swatter is used. For this purpose a series of holes is drilled in the end of the tube nearest the vinyl swatter and a wick inserted in the tube. A refill hole permits the housewife to use either her favorite scent or an air purifier if she considers that preferable.

As a final touch the company has put a metal three-way bottle opener on the other end of the handle for the dual purpose of prying lids off bottles and of acting as a hook for hanging up the swatter so that it will be handy for immediate use when needed.

ON land, sea or air the woman traveler will feel secure knowing that her cosmetics are packed in this leakproof vinyl case.

Stitched with nylon thread and closed with a zipper, the case is fashioned of an unsupported vinyl copolymer film of calendered stock obtained from Bakelite Corp. S. Buchsbaum Co., the manufacturer, calls this material, which is flexible and yet has great tensile strength, by the name of Elasti-Glass.

The vinyl is well suited to travel accessories as it is light in weight, waterproof and resistant to oils and greases. It will stand up under packing as it will not wrinkle or crack. And it will give good service in all climates, being impervious to fungi, mildew, extreme heat or cold. Further the material will neither rot nor dry out.

Loops are provided to hold bottles and jars. Space is also provided for carrying flat objects such as tissues. Contents can be identified through the semi-transparent vinyl.

PLASTICS PRODUCTS*

BANE of the butcher business has for some time been "shrink," a term used to describe the difference between the weight of the meat intended for sale and the weight actually sold at retail. The losses from shrink run high and are caused by mold, odors and loss of moisture.

Heretofore, if the butcher raised the refrigerator temperature to eliminate mold, he increased shrink due to dehydration. Now a clever and practical application of phenolics has removed one of the evils—mold shrink.

The Sanilite germicidal lamp, for use in refrigerators and meat display cases, is the product of Sanilite Co. and its important end fixtures are molded from Durez molding compounds by Grigoleit Company. One of these end caps contains a miniature transformer which supplies current of correct voltage to the ultra-violet lamp; the other houses the starter mechanism. The rods carry the wiring between the caps.

In the original experimental models and mock-ups, Durez casting resin was used, since it is easily machined for design changes. After all the details had been worked out in the cast models, compression molds were made for mass production, each cap being designed in two halves with integral flanges and assembly screw holes molded in.

The Sanilite, equipped with a standard germicidal lamp, has an automatic starter, is completely weatherproof and will not corrode when exposed to moisture or food chemical fumes. A big market is foreseen for it in food factories, hotels and institutions.

PLASTICS goes to the head in a smart and trim turban which flatters the face and would be a chic addition to the most envied of new Easter outfits.

Made of a nylon horsehair-like netting, dyed a fetching champagne pink and trimmed with black velvet leaves, the Eve Tartar creation made its debut before a select group of fashion-wise seers and was voted by them one of the hats most likely to succeed in the Spring of '46.

Practicality is a keynote of the hat since the nylon netting of which it is made has enough body to keep it from sagging and yet it is easily draped and will not crack or crease. Unlike most millinery nettings it will not wilt in the rain—in fact wiping it with a damp cloth is an excellent way of keeping it clean, brightening it and freshening up the material.

Add to these advantages the ease with which the nylon can be "dyed to the most delicate of feminine shades" and you have the story of why, according to Danciger Brothers, Inc., suppliers, it is destined to become a favorite with milliners and the women who will wear it.

This particular hat is made by building up tiers of the plastic net and fitting them closely around the head, then finishing it with a trimming, but the material likewise lends itself to a variety of shapes—sailors and wide brims included.

To look at this chapeau one would never think that it once lay on surplus property shelves in Army depots; yet that is where the material came from. Formerly it was used for military purposes and when the war ended it was carefully stacked in khaki bolts ready for purchase by anyone having the ingenuity to create a new demand for it. Due to American inventiveness it didn't remain very long in its unattractive state but was snapped up, cleverly transformed and used to pretty up milady's head.

PLASTICS PRODUCTS*

THE suitability of plastic materials for display fixture fabrication has been proved once more—this time in a brightly colored Plexiglas counter container for Camel cigarettes. Because of their light weight and dimensional stability, as well as their smoothness of finish and strength, the acrylics have been found to be especially adapted to point of purchase displays where they can take advantage of the impulse sales now being made.

The new display is designed and fabricated of ruby red acrylic by Art Display Service. Whereas the design of this attractive piece is worthy of study by virtue of its basic simplicity alone, it also represents a high level of ingenuity used by its creator in the fabrication of plastics.

When the sheet material arrives at the factory, it is protected by a paper backing. This is left in place until after the cutting has been finished. The paper surface is then removed and the name "Camel" and the product's sales slogan silk screened on the red acrylic. These pieces then move down belt conveyors in series for assembly on jigs, a method which has not only speeded production but has cut costs considerably as well.

Mass production methods were used in the fabrication and construction of these units, proving the suitability of acrylics to modern assembly line production. The cigarette displays were manufactured under strict factory supervision and their exacting dimensions and clean workmanship reflect this fact.

* Reg. U. S. Patent Office

PLASTICS and PLYWOOD IN A PRIVATE PLANE

ALL PHOTOS COURTESY CULVER AIRCRAFT CORP.

This anti-stall, anti-spin plane with automatic flying controls comes close to being an all-plastic craft. Its fuselage and wings are formed of laminated wood and covered with an impregnated fabric. The hatch is made of methyl methacrylate as are knobs, handles and interior trim. The flight control wheel, located between the seats (seen above), is made of phenolic compounds

A LOT of wise old heads shook doubtfully when the Civil Aeronautics Administration predicted that there would be more than 400,000 civil airplanes in use in the United States by 1955. This rise from the 30,000 licensed planes in 1945 seemed pretty steep. It might be accomplished, said the wise old heads, but only if: 1) anti-stall and anti-spin characteristics can be built into private planes, 2) flying technique can be greatly simplified, 3) bigger power units can be produced economically for private planes or more speed obtained from present power units, and 4) if repairs can be made economically and on home fields.

But the wise old heads aren't so sure today. They've seen the Culver Model V, a resin bonded plywood plane that makes extensive use of plastics inside as well as outside, a plane that meets all the requirements listed above, perhaps because its designer, Al Mooney, has made the most of plastics in all its parts.

This airplane was developed as a result of the experience gained by the Culver Aircraft Corp. in producing thousands of radio-controlled high speed target planes during the war. These P-Q planes could be operated either with or without pilots and they were so

tough that, frequently riddled by bullets and even partially shot away, they would land themselves, be given spot repairs, be refueled and then be flown by army pilots safely back to their bases. And the same construction used in these planes is employed in the Model V.

Forming fuselage and wings

The finest poplar plywood, formed of many layers of wood with the grain laid at 45 and 90° angles and bonded together with Plaskon urea resins, are used in the stressed skins of the Culver fuselage and wings as well as bulkheads and other structural parts. This plastic-bonded plywood is extremely strong—it had to be tough to take the beatings given it by Army and Navy gunners. Airplane-grade spruce forms spars, longerons, stringers and other support members. Spar blocks are walnut, while the controllable pitch propellers are made of laminated birch.

Additional strength and beauty are added to the plane by the preforming of wing and fuselage skins and the covering of the plywood skins with fabric and spreading of this fabric with Titanine plastic dope. The careful pre-contouring of the wings and fuselages to exact shape before they are applied to the supporting structure relieves internal stresses which would be caused if the plywood were merely bent over the structures. It also insures uniformity of fit.

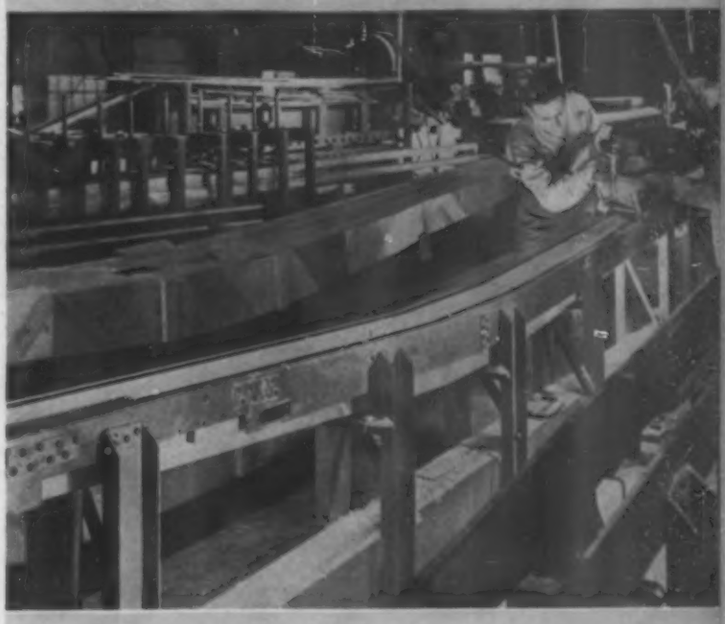
When the wing and fuselage have been assembled over the laminated spruce supporting frame, the entire assembly is lowered into a 1700-gallon tank of chemically treated sealer which provides a protective coat to the wood surface, making it impervious to moisture. Such protection adds an exceptionally high degree of permanency to wood airplane construction, and makes the Model V an all-weather airplane.

After its bath in the dip tank, the wing or fuselage assembly receives an application of surfacer and wood filler which insures a well-filled and smooth surface. Then fabric, popularly known as airplane cloth, is stretched tightly and smoothly over the surface and coated with a plastic dope, which further insures imperviousness to moisture and adds to the tensile strength of the surface. When the paint is applied, it goes on a surface that is as smooth as the surface found on fine furniture.

Optimum ease in flying

Simplicity of flight training and flying operation is accomplished by means of the Culver Simpli-Fly Control, a device which interconnects the controls and thereby causes the airplane to automatically trim itself for the flight altitude for which the controls are set. Settings of the control system for various flight altitudes are obtained by turning a molded phenolic flight control wheel located between the seats of the plane. These settings, in turn, are registered on the flight dial, which reads in English rather than in degrees to make them less confusing to the beginning pilot. When the pilot wants to take off, he turns the control wheel

To relieve internal stress on the laminated wood, the fuselage and wing skins are preformed in steam presses



Uniform contour of the wooden spars is assured by cutting them with a router that runs along a steel track

Because full-strength resins are so important to proper adhesion, a glue cart distributes fresh resins every hour

to where the indicator on the flight dial points to "Take-Off," and the plane is automatically trimmed for best take-off. Once in the air, he turns the wheel to position "Climb," and when the desired altitude has been attained, he turns the wheel to "Cruise" and the plane automatically trims for best and fastest cruise. In coming in, the pilot cuts the power off, sets his controls for "Approach" and the plane trims itself for its flattest glide. For landing, the wheel is turned to where the dial reads "Glide Control," and the plane then starts to set down for a landing. The flight control device at any given setting is the factor which determines the speed of the plane and in the air the pilot flies by wheel alone. In five hours, a novice can solo and after a matter of 60 to 70 hours can become an expert pilot.

Non-structural plastic parts

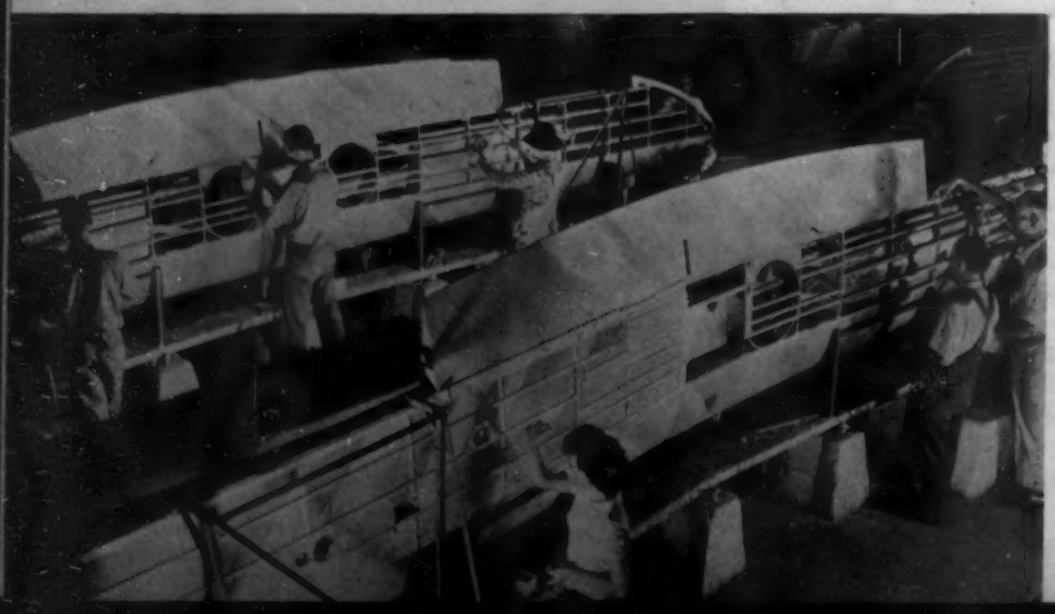
The use of plastic materials goes beyond structural application. An all Lucite hatch, fabricated by the Magnesium Manufacturing Co., provides maximum visibility and is set in a frame of magnesium extrusion. It opens forward, just behind the engine cowling, making it unnecessary to step on the seat when entering the plane. Lucite is also used for the control knobs, the handle tip of the control stick, and for decorative purposes in the interior.

Goodyear's newly developed nylon and rubber gas tanks go into the leading edge of the wings. These 35-gallon tanks, weighing less than 7 lb., are much lighter than metal tanks. The location of the gas tanks in the leading edge of the wing is a safety factor which takes them out of the cabin where a cigarette spark would be a fire hazard. Another reason for the location of the gasoline tanks is that they have very little effect upon the center of gravity at this point. The same is true of the location of the luggage compartment. Thus in figuring plane load, it is not necessary to sacrifice gasoline for baggage, or vice versa.

If metal gasoline tanks were used it would not be practical to locate them in the leading edge of the wing because in shaping metal tanks to the wing the stress would be too great. Also, the vibration from the wings would cause metal tanks to break at the seams. The use of nylon and rubber tanks not only relieves the strain on the wing but eliminates the harmful effects on them which could be caused by vibration—one of the evils of flying.

As to repairs—the matter is simple! Repairs on a plastic-bonded wood plane can be made at point of break only, without affecting the rest of the plane. In contrast, repairs on, say, the rear of a metal plane may necessitate a check on the front of the ship too, since some other part of a metal ship may have been pulled out of rig either when the plane was damaged or during the course of repair. Then too, wood repairs can be made quickly at any competent repair depot without necessitating delay by having to return the ship to the factory.

Some of the wise old heads that shook before are nodding now—in approval—for the Culver Model V appears to have met the challenge. Powered by a Continental 85-hp. fuel injection engine, it's one of the fastest light airplanes in its power class—a distinction made possible by its lightness, its structural strength and clean lines, afforded by the combination of wood and plastic materials.



Top—After fuselage and wings have been assembled they are lowered into a tank of seal coating which protects external surface. Left—Here the external skin of the wing is being applied. The portion in the left foreground has only just been completed

IMPRESSION MOLDING

...its position in the molding field

PHOTO, COURTESY MONSANTO CHEMICAL CO.

This lifeboat with a one-piece impression-molded hull has obvious advantages over boats made with the planked hulls

by R. W. CRAWFORD and I. B. NATHANSON*

Probably much more has been written in the last three years about impression molding than any other plastics subject. Despite the very extensive—and very healthy—discussion, there is little agreement on the future of this class of processing and, indeed, there is no general agreement on the very terminology.[1] The term *impression molding* has been suggested to comprise those processes variously known as flexible pressure molding, fluid pressure molding, contact pressure and low pressure laminating. While these processes differ one from the other, the generic name of impression molding is utilized here to distinguish them from conventional compression, injection and extrusion molding.

The theories and mechanical details of impression molding have been described in detail in these pages and elsewhere.[2] It is only necessary to bear in mind the fundamental characteristic that pressure requirements are very much lower in impression molding or laminating than in conventional methods. Elimination of pressure necessary to hold in the volatiles and elimination of pressure to position the material, leaves as a pressure requirement only that necessary to hold the materials in firm contact with each other and with the mold and that which is needed to achieve the desired degree of surface finish.

In conventional molding, high pressures impose requirements for structural strength in the equipment by which it is applied—molds, presses and machines must be built to stand extremely high stress. These in turn set up rigid maximum limits on the size of part that can be produced by compression or injection molding. Theoretically, there is no reason why, for example, a small boat cannot be compression molded. But the cost of molds and presses increase at a disproportional rate as size goes up so tooling and machinery costs for such a project would be entirely out of proportion.

This important handicap is attacked by impression-molding methods. Since only low pressures are involved, molds and equipment can reach a large size without becoming prohibitively expensive. This does not necessarily mean that production molds for impression molding are likely to be cheap and light. Where quantities required are fairly high, say over 7500, and where surface finish is important, steel molds will be preferred, with plated or polished surfaces. Unlike compression or injection molding, however, it is possible to utilize light molds for short run or experimental production. In these cases the molds can be made of cement, wood, sheet metal or cast resin. Even steel molds for impression molding can be simpler and lighter than molds of the same size would be for compression or injection.

Present processes require much hand labor

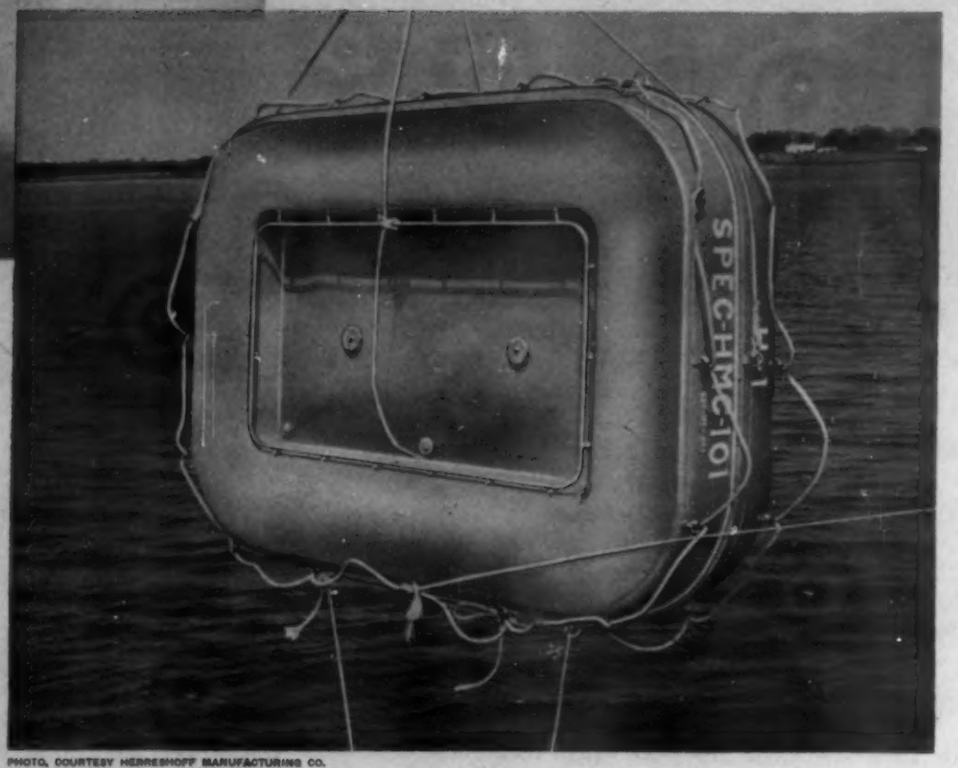
In evaluating the future of impression molding, it is necessary to bear in mind that this process is essentially a war development—the radomes and aircraft parts manufactured during the last four years were made under war conditions. Cost was not a controlling

* Product Development, Plastics Div., Monsanto Chemical Co.

[1] "Let's define impression molding," MODERN PLASTICS, 22, 136–137, 190 (April 1945).

[2] "The how and why of low pressure molding," C. B. Hemming, MODERN PLASTICS, 23, 129–133 (Oct. 1945).

A 25-man, low-pressure molded life float developed for the Armed Forces was tested and found well able to withstand the impact of water when dropped from a great height, simulating conditions it would meet in use



PHOTO, COURTESY HERRESHOFF MANUFACTURING CO.

The life raft is molded in two sections of an impregnated fabric. The halves are sealed together in a final assembling process at which time the fittings and various attachments are also added

factor and present impression-molding methods appear to use a lavish amount of hand labor. Further, virtually all production to date has employed rubber bags and autoclaves. While this process is well suited to certain products, it is essentially not a mass production method, involving as it does relatively long cycles, much hand labor and diaphragm replacements.

Impression-molding products, if they are not to be expensive specialties, must be developed to the point where hand labor is at a minimum and full advantage is taken of the materials handling methods developed in other industries. Economical operation of an impression-molding plant will depend to a large extent on efficiency in handling, laying up and moving raw materials and finished products which are apt to be bulky and large in unit size.

To reach an evaluation of the place of impression molding, it is necessary to consider individual fields and individual applications in relation to present materials or alternates.

Wall panels one of the first civilian uses

One of the first uses to which impression molding or laminating will be put on a commercial scale is in wall panelling. Such decorative wallboard consists of one or more layers of woven cloth or paper, impregnated with a resin content of about 50 percent by weight, and cured into rigid panels by a continuous process. In general, such panelling will have the characteristics of high pressure laminates, but there will be no size limitation imposed by press platens. Such impression molded boards or panelling can be made continuously and on a much shorter cycle than high pressure laminates. If a polyester type resin is employed, there is no solvent loss or recovery problem.

Availability of this wallboard in the near future will broaden the field for decorative laminates since it will be easy and economical to apply to large wall areas. While types now under development are essentially decorative rather than structural, this type of material can be expected to be used in transportation equipment as well as in building construction. By the production of sandwich material for a two-faced panel using a corrugated core and phenolic resins, semi-structural and load bearing panels can be produced.

Impression laminated wallboard, when available in quantity, can be expected to move into channels that now fabricate high pressure laminates or sheet thermoplastics, and panelling made with special formulations to permit post-forming will also be available for use in some applications.

The utility of flat panelling produced by impression-

molding methods is increased by the availability of flame-proof resins. Used with inorganic textiles, such as asbestos or glass cloth, or flame-proofed cotton or rayon, a fully fireproof laminated product can be made in this manner.

Boats as field for impression molding

A number of fields have been intensively studied as outlets for impression-molded products, one of the first being boats. Already boats are being produced from sisal fiber treated with low pressure phenolics, the material used in the construction of thousands of jettison tanks. Craft of this kind can be fitted with sails, with motors or with oars, and a wide variety of types can be evolved. The hulls are one piece, a construction that possesses a number of advantages over planked hulls. Several boat companies are also working on hull constructions involving the use of cotton duck, impregnated and layed up on a simple mold. The true practicability of both types can only be determined from actual service records, which will take several years to compile.

Impression-molded toys

The field of large toys—express wagons, doll carriages, scooters and tricycles—has been investigated. In this case the competition is drawn and stamped sheet steel. One-piece bodies for express wagons can be knocked out from medium-gage steel sheet at low cost to provide a highly serviceable unit. It is unlikely that impression molding offers sufficiently important advantages over metal in this application to justify what would undoubtedly be a higher cost. The same is true of scooters and similar wheeled toys which are excellently made of steel. In the case of tricycles which are now welded from lengths of shaped steel pipe or tubing, a complete redesign for use of impression molding would be absolutely necessary with somewhat questionable advantages to be gained by following such a course.

Possibly the most important opening for impression molding in the toy field will come from the development of toys quite different from anything on the market at the present time. The case is somewhat different with doll carriages which are usually fabricated from wood or woven wicker. It is entirely feasible to design an impression-molded doll carriage which would be better looking, better styled to sell somewhere near a competitive range, and would have equivalent or better serviceability than that which is available in present-day carriages.

Luggage a logical application

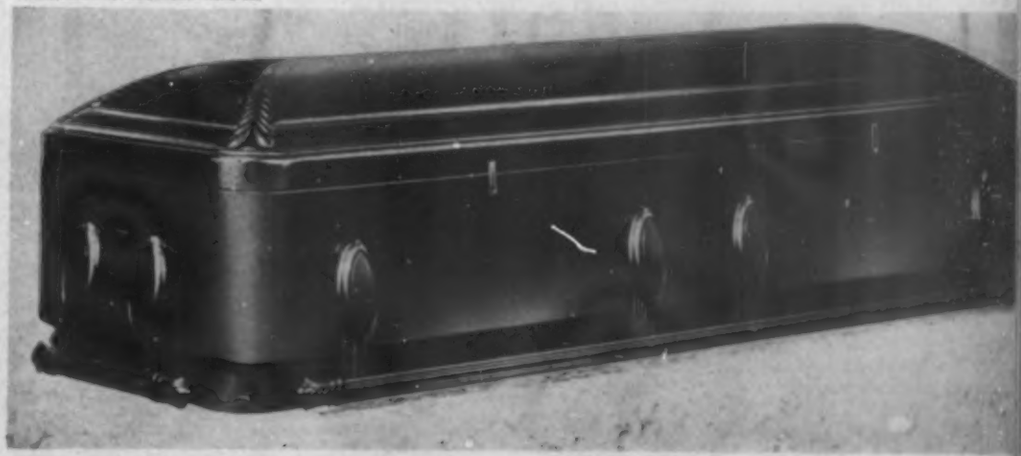
Luggage has long since been proposed as a logical field for impression moldings. There is no doubt that this process cannot compete in the lower price bracket, where the largest volume lies, with luggage made of low-grade plywood covered with varnished cloth. On the other hand, it probably cannot compete with the high quality market where genuine leather is utilized, roughly in the price bracket above $35.00 per unit. There is, however, an intermediate field for impression-molded bags and suitcases of better appearance and improved serviceability over so-called airplane luggage but lower in price than leather goods. The article, "Molded Luggage" appearing on pages 147 through 150 of this issue is a practical illustration of what can be done in producing luggage of this type by this method of manufacture.

Five possible future applications

Two other applications which have been suggested as outlets for this process are refrigerators and large radio cabinets. Impression moldings appear to have definite possibilities for refrigerator inner shell units and door liners. Commercial production of these can be expected this year. Work on radio cabinets has not progressed as far. Here there are two unanswered questions. One is cost; the other is that of public acceptance of an altered, even if an improved, appearance of a familiar article.

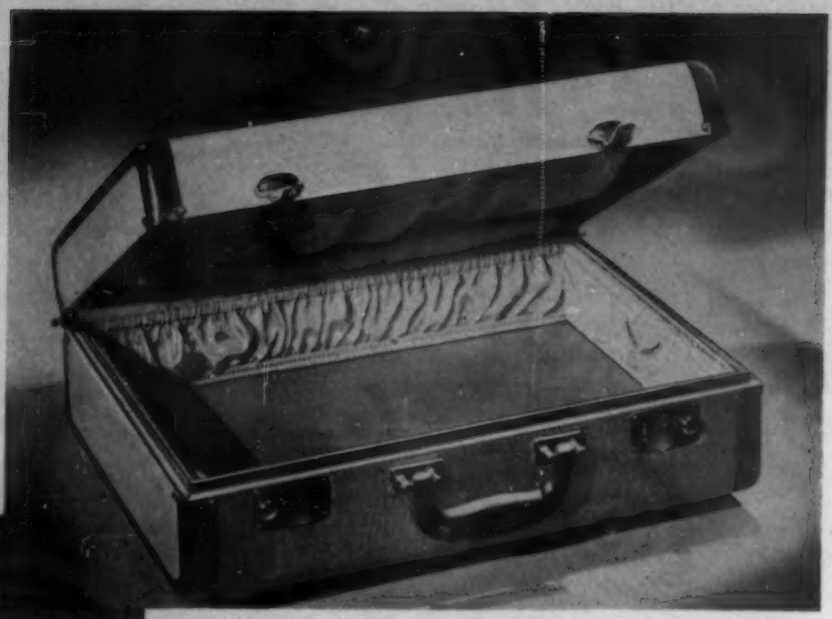
In the automotive as in the toy field, stamped and drawn steel present very formidable competition. For the general run of automotive body parts such as fenders, door panels, tops and hoods, which are made literally by the millions from steel sheet, impression molding is out of the running on a price basis in the

PHOTO, COURTESY COLUMBIAN ROPE CO.



One field which is opening up to low-pressure molding is the making of caskets of which this is an example

Right—A logical field for low-pressure molding is found in luggage. Present work along these lines indicates that this type of structure will find the best outlet in the medium-priced field. Below—Flat pieces, as well as curved ones, lend themselves admirably to low-pressure molding. V-board was used during the war to support fuel cells in planes



PHOTO, COURTESY OWENS-CORNING FIBERGLAS CORP.

PHOTO, COURTESY U. S. RUBBER CO.

foreseeable future. This is particularly true in view of the fact that steel is an excellent and proved material for the purpose. In certain types of auto body work, however, such as station wagons which are now put together virtually by hand, impression molding may find an outlet.

Certain types of furniture present a fairly clear-cut market for impression molding. Dinette tables, side tables, coffee tables, small book cases, bathroom hampers and tools can be produced by impression molding within the price range in which such products are now sold. It will be necessary in these cases, however, to get public acceptance of rather radically new designs. This type product will also take advantage of the design possibilities of incorporating in the molded product printed, patterned and textured cloth or paper which is made impervious and washable by the impression-molding method. From the standpoint of appearance and utility this furniture should have a great deal to recommend it to the average housewife.

There is little possibility in the immediate future of plumbing fixtures being impression molded. Information presently available indicates that such products could not have the high water resistance necessary to withstand long immersion at frequent intervals such as encountered in a sink basin, bath tub or toilet. While great advantages in weight and possibly in color and design would be offered, shortcomings of resins and fillers presently available virtually eliminate this kind of application.

It is not possible to generalize on the uses of impression molding in the industrial equipment or machine tool field. Undoubtedly, certain types of production equipment could advantageously use housings, bases or casings that are impression molded, but in this field each application presents a particular problem which must be studied and evaluated on its own particular merits.

The lighting field in general offers a promising future for impression molding. Shades for incandescent table lamps can be produced with definite style advantages and yet be completely washable. Translucent fluorescent lighting shields are also a logical field of application. With a proper choice of filler and use of transparent resins it is entirely feasible that the rate of light transmission and diffusion can be controlled to meet specific design specifications. Shields such as these would share with other plastics several of the quite obvious advantages of light weight, ease of installation and of cleaning.

In the final analysis, the field for impression molding will be delineated only as products are created and tried in the market. In view of the intensive work being carried out by a number of organizations at this time, a clearer picture of the future will undoubtedly develop shortly.

Balance in a phenolic fan blade

Balance was achieved in this fan blade through the use of specially shaped and weighed preforms

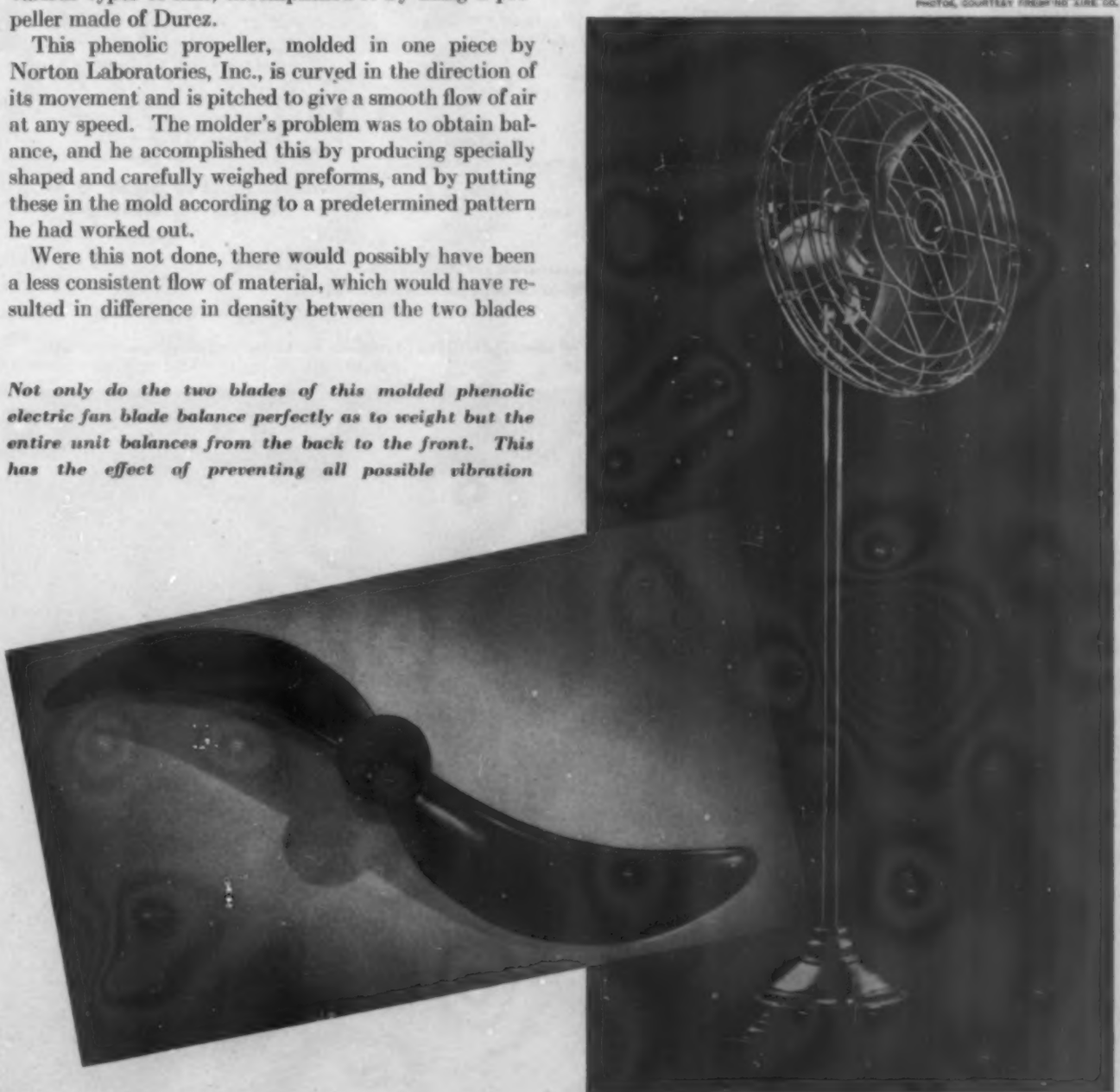
THE great difference between a modern air circulator and the old-fashioned electric fan is in the power and silent operation of the former and the design of the propeller—used for overall air circulation instead of air pushing. And this silent power is achieved through careful balance of the propeller unit and of the motor. Fresh'nd Aire Company which manufactures various types of fans, accomplished it by using a propeller made of Durez.

This phenolic propeller, molded in one piece by Norton Laboratories, Inc., is curved in the direction of its movement and is pitched to give a smooth flow of air at any speed. The molder's problem was to obtain balance, and he accomplished this by producing specially shaped and carefully weighed preforms, and by putting these in the mold according to a predetermined pattern he had worked out.

Were this not done, there would possibly have been a less consistent flow of material, which would have resulted in difference in density between the two blades of the propeller. As it is, the two blades balance perfectly as to weight and the whole propeller balances perfectly from back to front on its bearing, so that all possible vibration, which might be caused by it or the motor, is prevented.

Three models of the air circulator are designed for home use, three others for office or industry.

PHOTOS, COURTESY FRESH'ND AIRE CO.



Not only do the two blades of this molded phenolic electric fan blade balance perfectly as to weight but the entire unit balances from the back to the front. This has the effect of preventing all possible vibration

Plastics Stock Molds

SHEET ONE HUNDRED THIRTY-SIX

Miscellaneous household accessories, such as vanity mirrors, shoe horns and dust pans, which are ideal for premium use, are available from stock without mold cost. Additional information, including manufacturer's names and addresses, may be obtained from the Stock Mold Div., Modern Plastics, 122 E. 42nd St., New York 17, N. Y. Please state sheet and item number.

614. Double-faced, swivel, standing mirror, 7 in. in diameter. Mounted on decorative base, 12 in. long by 4 1/2 in. high. One side is plain, the other magnifying. Available in light and dark mottled colors

1615. Double-faced, swivel, wall mirror, 6 in. in diameter. Wall bracket is 8 in. long by 5 in. high. Can be attached permanently to any type of surface. Necessary screws or cement furnished

1616. Shoe horn, 14 in. long. Available in clear and opaque colors

1617. Shoe horn, 13 in. long

1618. Collapsible cup, 2 1/2 in. in diameter. It is 2 3/8 in. high when opened

1619. Dustpan, 10 1/2 in. at base. Available in assorted colors

1620. Shoe horn, 5 1/2 in. long

1621. Napkin case with hinged cover. It is 3 in. wide by 4 in. long by 1 in. deep

1622. Sunglasses with flesh-colored plastic frames and tinted lenses

1623. Pipe stand combining pipe holder and match packet groove. Overall length, 3 3/8 inches

1624. Safety razor consisting of three molded parts. Handle is 3 inches

1625. Two-piece lipstick brush. Overall length, 4 inches

1626. Tie clip, 1 in. long by 1 in. at base tapering to 3/4 in. at top

* Reg. U. S. Patent Office.

Items 1–1582, which have appeared previously, are correlated in the Plastics Stock Mold Catalog, available for $5.00.

Molders and fabricators are invited to submit samples of stock products to appear on these pages as space permits.

The cementing of thermoplastics

There is small excuse for poorly cemented thermoplastic parts if the following compilation of facts concerning the why and how of this operation are carefully observed

DURING the war, the plastics industry made many contributions to the production of aircraft. Of all of the materials used, acrylics probably reached by far the greater tonnage. There were probably no fighters or bombers which were not equipped with at least one and oftentimes several more formed domes or noses fabricated from this material. In troop-carrying gliders, formed acetate enclosures were used.

Since the production methods used for these thermoplastics turned them out in sheet form, rectangular or square in shape, there was a great deal of perfectly usable scrap left over each time a circular dome was formed. This scrap had practically no value for aircraft use. As a matter of fact, it had very little, if any, value in the fabrication or forming of *any* parts for the war effort and sizable quantities accumulated.

As availability of metals reached the vanishing point, the American business man suddenly discovered this stock pile of apparently useless scrap. Almost overnight many small and some large specialty fabricating shops came into being for the express purpose of shaping and forming this material into usable articles ranging from handles for handbags, cigarette boxes, picture frames, jewelry boxes and even rings and jewelry.

Much has been written pro and con regarding the value and quality of the parts produced by these fabricators. In many cases, the writers pointing out the poor quality of this type of merchandise have been correct. There were, however, many millions of parts produced from this material which had a definite value. By and large, these were produced by the better class fabricator who, having a thorough knowledge of production methods, produced satisfactory articles.

In all this fabrication there were a few operations which were a part of almost every production scheme. The forming and bending of the softened material was probably employed more than any other operation. Sawing and cementing were also at the top of the list. There have been many complaints against parts which were supposed to have been firmly cemented together but, after purchase, either parted slightly at the cemented joint or, in some cases, completely fell apart. Plastics, as such, were given a very great black eye by failures of this type, but in no case could the blame be laid at the door of the plastic material.

Actually, these failures were caused by poor fabricating techniques on the part of the manufacturers. This situation could have been brought about by a complete lack of interest in producing satisfactory parts but, more probably, it can be attributed to a lack of knowledge of techniques on the part of certain fabricators.

A great deal of information is available on cementing and it is hoped that the following compilation of all of these facts will aid the fabricators in producing satisfactory parts. With care and practice, it is possible to obtain with two pieces of clear acrylic a cemented joint which closely approximates a solid block of plastic in transparency. Figure 1 illustrates the laminating of two sheets of acrylics in such a manner.

The cementing of thermoplastics depends on the intermingling of the two surfaces of the joint so that there is cohesion similar to that in the material itself. This principle differs from wood gluing, for example, which depends on the adhesion of the glue to each of the two surfaces being bonded. To effect cohesion between pieces of thermoplastic material, an organic liquid solvent is used which actually attacks the plastic, forming a well-defined soft surface layer called a cushion. Most known methods of cementing thermoplastics are based on this solvent action which permits two surfaces when pressed together to intermingle and finally unite in a true cohesive bond. I believe that the term *welding* is actually more descriptive of this process than the term cementing, and that the term *solvent* is more descriptive than the term *cement*, although this latter term is the one most commonly used to describe material making this welding.

Welding acrylics

In welding acrylics, much of the work on larger pieces is accomplished through the use of the *soak* method. This operation consists of dipping one of the two pieces to be welded into the solvent and holding it

* Reg. U. S. Patent Office.

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PHOTOS 1, 2 AND 3, COURTESY PLASTECOK MFG. CO.

1—Four stages in cementing thermoplastics, left to right: 1) two bars with mating surfaces, 2) bars cemented but unpolished, 3) same assembly, polished, 4) disguising outside weld line by machined design. 2—Solid and welded pieces show equally good transparency

there until a softened cushion is formed on the surface to be welded. When the piece is removed from the solution, the surface of the cushion is wet with solvent. As this surface is pressed against the dry surface of the other part being welded, the excess solvent forms a second cushion on this matching edge, shallow but enough to permit the intermingling of the two surfaces.

Sometimes, for convenience in handling, clean acrylic shavings are dissolved in the solvent to give it a thick viscous consistency so that it can be applied like glue. This thickened solvent, however, works on exactly the same principle as a soak solvent, the viscous material acting only as a carrier for the solvent. It may be applied by means of a brush or some other mechanical applicator. In any case, the subsequent handling is the same as when solvent alone is used.

Matching edges—Satisfactory bonds are affected by a number of factors. The fit of the two parts to be joined must be accurate. In butt joints, for example, both edges must be made true and square before the welding operation is begun. It is always easier to bond flat surfaces than those that are formed or curved. Therefore, it is advisable, when possible, to route or sand all curved sections so that flat surfaces are available for joining. If, due to design, the areas for bonding must have a curvature, it is essential that the curves of both parts be of the same radius, that is, if they are to be butt joined. If construction calls for an overlap joint, then the radii of the two curved parts should be different enough so that the two areas mate perfectly.

A smooth surface—The two surfaces should have a fairly smooth finish. Generally, it is inadvisable to polish surfaces of parts to be welded. In most polishing techniques some sort of wax-carried abrasive or polishing compound is used. This material, if it remains on the surface of the parts to be welded, presents a barrier to the solvent. Rather than polishing or smoothing with a buffing wheel, rough surfaces should be sanded smooth. Unless this is done there will be weak points along the joint.

Before an acrylic sheet is immersed in the soak bath, it is necessary to confine the softening action of the solvent to the area of the joint. Tough paper or cellophane tape coated with a pressure-sensitive adhesive gives satisfactory protection for the sheet surface, being impervious to the action of the solvent. It is important that the tape be well applied, particularly at the edges, and that enough overlapping is allowed to prevent the cement from seeping under the edges. Be sure that no air bubbles are trapped under the masking tape. It must be remembered that the liquid solvent on the cushion surface is the bonding agent. For this reason, the size of the cushion need be no greater than necessary to obtain intimate contact throughout the entire area to be welded.

Soaking time—Although each job will vary somewhat, a good average time for soaking is 15 minutes. It is the interval between the soak tank and the assembly of the joint that is, perhaps, the most critical in the entire cementing operation. As stated above, it is not the cushion but the liquid on the surface of the cushion that effects the bonding. Since these liquids evaporate quickly, it is necessary that the joint be assembled as rapidly as possible. If the cushion surface is allowed to dry or if it is wiped free of this liquid before the joint is closed, apparently sound joints may be affected if sufficient clamping pressure is applied. However, when the pressure is removed, the joint may break open. At best, they will have poor strength qualities.

The tank containing the soaking solvent should be near the fixtures used to clamp the parts being welded, and the entire setup should be so arranged that the operator can accurately assemble the two parts with maximum speed. If, due to an unavoidable delay, the cushion surface should dry or crust over, it should again be wetted with solvent.

Application of pressure—Another important factor in the successful cementing of plastics parts is the slight time interval which must be allowed between the time the two pieces are placed in contact and the time actual bonding pressure is applied. It is during this interval

that the liquid surface of the cushion is being absorbed by the opposing dry surface. It follows that an immediate application of pressure will partially squeeze out the liquid solvent from the surface of the cushion. A satisfactory interval is from 15 to 30 seconds.

The jig—In many cases, the success of a cementing job depends on the jig which has been designed for holding the two parts firmly together until the joint is hard. In the case of curved sections, however, these jigs should not tend to force either part out of shape. Crazing and unsatisfactory bonding will result if a sliding action of the two surfaces is caused by the clamping arrangement. The jigs should apply sufficient pressure so that all air bubbles are squeezed from the joints assuring a thorough intermingling of the cushions; and the pressure should be uniform throughout the area.

The jigs or clamps should be designed so that they compensate for the shrinkage which always takes place during the hardening of the solvent, for only in this way will the pressure on the bonded joints be held uniform. If the two pieces are held rigidly so that they cannot move together while the joint is drying, the bead of excess cushion will tend to draw back into the joint. This will result in dimples along the outside surfaces of the joint. In some cases, air bubbles may even be visible. Spring clips or standard storage battery clamps should be part of the design of every clamping jig. After the assembly has been locked into position in the jig, the excess cement and cushion which is extruded from the joint should be removed. This operation will save a great deal of sanding and polishing time after the joint has set. The assembly should be allowed to stand in its jig for at least four hours, and an additional period of four to five hours should elapse before the joint is subjected to handling.

If left at room temperature, the solvent in the center portions of the cushion will penetrate slightly into the plastic and an equilibrium of solvent and plastic be established that will remain practically stable at normal temperatures. If the temperature is raised, the cushion will slightly enlarge until a new equilibrium is reached. Upon cooling, the size of the cushion will remain constant and it will be harder since some of the solvent will have evaporated from the joint.

Heating a solvent joint long enough to expand its cushion to a new equilibrium will, therefore, produce a much stronger joint. This operation must, however, be undertaken with caution. When the cushion expands under heat, especially if the plastic at that point is thick or if the cushion is already too large or deep, this expansion may cause serious weakening of the plastic section. It is also important that the heat-treating temperatures should not approach the softening point of the plastic material. Nor should they exceed the boiling point of the solvent. A safe heat-treating cycle may be accomplished with a temperature of 45° C. (113° F.) over a period of from 96 to 168 hours. In some cases, the temperature may be raised to 50° C. (120° F.) for a period of 48 hours. Within these limitations, the strength of the joint depends on the highest temperature to which it has been subjected, although the temperature is limited to that heat which will not cause dimensional change in the assembly.

Whether or not the joint is heat treated, it is important that it be thoroughly hardened before it is machined, sanded or polished to remove the extruded bead. The softened material in the joint will continue to shrink until it is fully set. If a joint which is not completely set has been trimmed or sanded too soon, a visible recess will be left along the joint after the hardening has been completed.

Recommended solvents—The following discussion of the solvents recommended for welding, as well as pointers on their care and use, should round out the entire picture of the welding acrylics. One highly recommended material is a mixture of equal parts of monomeric methyl methacrylate (inhibited with 0.006 percent hydroquinone) and methylene dichloride. Immediately before using this solvent, a small capsule of benzoyl peroxide is added as a catalyst. The proportion of catalyst is approximately one small capsule of catalyst to one pint of solvent mixture. After the addition of the catalyst, the solvent will tend to thicken slowly unless it is refrigerated. It is advisable, therefore, to catalyze only enough solvent for about one-half day's work.

In use, this solvent mixture not only tends to thicken but it also tends to lose a percentage of its methylene dichloride component. This loss is due to the higher rate of evaporation of methylene dichloride as compared to that of the monomer component of the solvent.

Specific gravity is probably the best basis for checking the relative proportions of the two components of the mix. This specific gravity is practically independent of the amount of acrylic dissolved in the solvent mixture, a high grade hydrometer generally being satisfactory for determining this specific gravity. However, it is advisable to cross-check the reading of these hydrometers against a fresh mixture of solvent in which the proportions of the components are known. At a temperature of 25° C. (77° F.), the gravity of this fresh mixture should be 1.13. If the hydrometer has a different reading, a corrective factor (the difference between the actual reading and 1.13) can be applied to all future readings. The specific gravity of the solvent should be

3—Cementing is almost indispensible in producing from sheet stock articles like this salt and pepper holder

3

kept within the following ranges at the following temperatures:

Temperature		Permissible range specific gravity
° C.	° F.	
20	68	1.13 to 1.18
25	77	1.12 to 1.17
30	86	1.11 to 1.16
35	95	1.10 to 1.15
40	104	1.09 to 1.14

If, at the time of checking, the specific gravity of the solvent is found to be below the permissible limit, it should be adjusted by adding methylene dichloride in quantities sufficient to bring its specific gravity up to the maximum specified limit. An accurate method of doing this correcting is as follows: for each 0.01 unit of required correction in specific gravity, methylene dichloride should be added in the amount of 2.5 percent of the volume of the solvent mixture being corrected.

If a more active solvent is required, as when small parts that will not be expected to withstand heavy stresses are welded together, or when the production rate for economic reasons must be faster, the liquid methylene dichloride may be used without any other components. In this case, however, the bonded joint is apt to show *blushing* or whitening at the point of weld. Monomeric methyl methacrylate may be used as a solvent but is not recommended for a perfect job.

Still further down on the list of recommended solvents is glacial acetic acid. And at the very bottom is acetone. These last two are not recommended except in case of emergency. Great caution should be observed in the handling of glacial acetic acid, since it is very corrosive and irritating to the skin and eyes.

Bonding of other thermoplastics

The bonding of other common thermoplastics such as cellulose acetate, cellulose acetate butyrate, polystyrene and cellulose propionate demands a somewhat different technique from that used in the bonding of acrylics. The soaking process, as previously described, should never be used when bonding the above-mentioned materials because of the quicker action of the solvents on these materials. Even though the surfaces of these thermoplastics are completely protected by masking tape, the action of the solvent through the exposed edges of the material will quickly ruin its appearance over a wide area. Even if a short soaking period is attempted, a large amount of solvent will be trapped causing subsequent crazing and swelling.

Application of solvent—If a solvent is to be used for the bonding of materials such as cellulose acetate, cellulose acetate butyrate, polystyrene and cellulose propionate, several methods are available for its application. For instance, a brush dipped in the solvent may be used, in which case the operator must be careful that the solvent is painted only on the bond surface.

Probably the most widely used method is the dipping method. A quantity of solvent is poured into a suitably shaped container and maintained at a constant level by an auxiliary supply of solvent held in a glass jar and piped directly to the larger container. A felt pad is placed in the large container so that its top surface is just level with the surface of the solvent. A fine wire screen should then be placed over the top of the pad. The felt pad will act as a wick allowing light contact of solvent with the part to be welded. The screen will, at the same time, prevent contamination.

The surface of the parts to be bonded should be placed on the wire screen until the material has softened substantially, then the pieces should be clamped into position and held until the bond has set. With small parts, this operation is usually done by hand since the joints set enough in a few seconds to allow the assembly to be put to one side for complete drying.

In order to secure a bond as strong as the molded pieces themselves, it is necessary to soften substantially the edges to be joined and then clamp the parts together. This may cause a protuberance at the joint which, after the pieces have been allowed to stand for from 24 to 48 hr. to permit the solvent to evaporate, will have to be removed by mechanical means. This finishing is followed by a polishing of the parts.

Solvents—Acetone is one of the most commonly used solvents for the cellulose esters. It is not ordinarily advisable, however, to use this solvent alone because of its high evaporation rate which is likely to cause blushing. This phenomenon presents a white frosted appearance on the cemented pieces. Also, plain acetone may evaporate before it has had an opportunity to soften the surfaces and effect adhesion.

Blushing is prevented and evaporation loss reduced by adding to the acetone one or more solvents of higher boiling point. Methyl Cellosolve acetate is recommended. This addition, however, will increase the drying time of the welded job. If the pan containing the solvent has a large opening, an unequal rate of evaporation will gradually cause the mixture to lose a percentage of its acetone. This may be corrected by replenishing the pan with a mixture richer in acetone.

In some cases, it might be advantageous to use a solvent more viscous than either acetone or methyl

4—Here the halves of a barrel bank are being assembled by cementing. Surfaces for gluing are placed on felt pad partially immersed in acetone. Felt acts as a wick, transferring a little acetone to edges to be assembled. Halves are held together briefly with light pressure

PHOTO, COURTESY ELMER E. MILLS CORP.

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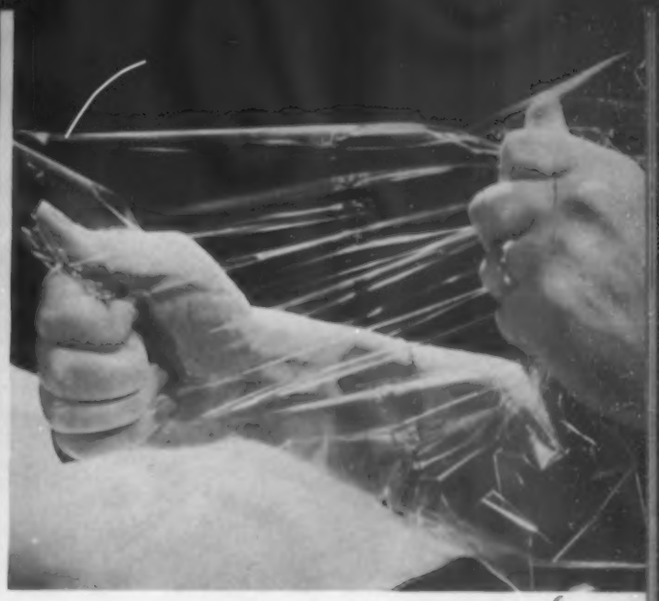

PHOTOS, COURTESY CELANESE PLASTIC CORP.

5 6

5—To weld two pieces of thin gage acetate, a pen applicator containing solvents and having a spongy tip permitting free even flow is run along the edge of one sheet and the edge of another sheet quickly laid on top. 6—An operator demonstrates the high strength possessed by the weld line

Cellosolve acetate. Use of such a solution may be indicated on jobs where the surfaces are not smooth. In a case of this type, the viscous solvent, called variously *dopes* or *body cements*, will fill in the voids and aid in producing a satisfactory uniform bond.

There are several formulas for producing such material. For cellulose acetate, a good cement is made with 10 parts of cellulose acetate, 60 parts of acetone and 30 parts of ethyl lactate (all parts by weight). The cellulose acetate butyrate formula is 10 parts of cellulose acetate butyrate, 60 parts of acetone and 30 parts of methyl Cellosolve acetate. If the objective is to bond cellulose acetate to cellulose acetate butyrate, a suitable material has the following composition—75 parts cellulose nitrate (medium viscosity), 25 parts camphor (nitrate film scrap can be used in place of the first two ingredients), 400 parts acetone and 200 parts ethyl lactate (all parts by weight). A satisfactory dope or body cement for cellulose propionate can be made with 10 parts of cellulose propionate, 60 parts acetone and 30 parts methyl Cellosolve acetate.

If it is found absolutely necessary to bond one of these thermoplastics to other materials such as glass, metal, paper or rubber, the best procedure is to solicit information on the best bonding agent directly from the manufacturer of the thermoplastic material involved.

Welding of polystyrene

In welding polystyrene the same techniques previously described for the cellulosic compounds will apply. In this case, however, the most desirable solvent is benzol. During the war, this material was very difficult to obtain, so as a substitute, xylenol was used. With either of these solvents, it would appear to be better practice to use a more viscous solution than that afforded by the plain solvents. In order to accomplish this, granules or shavings of polystyrene are quickly dissolved in either type of liquid solvent until a proper mix is obtained. A good rule-of-thumb to follow is approximately a 50-50 mixture by weight.

The toxicity of these two solvents is rather great and, for this reason, it is well to make arrangements for ventilating the area in which they are used.

In all of the above-mentioned cases, the addition of a heat and pressure stage during the setting operation will produce a stronger and more satisfactory bond. Although it is true that each job will require slightly different temperatures and pressures, due to the variation in the hardness of material, the depth of penetration of the solvent and the amount of solvent absorbed, the following figures will give fairly consistent results: At a temperature of 120° F., a pressure of from 50 to 100 p.s.i. (this is just light clamping pressure) and a time interval under this heat and pressure of from 24 to 48 hr., a satisfactory job will be produced.

Laminated sections

It is also possible with most of these thermoplastic materials to produce built-up sections or what might be called laminated sections. If it is desired to laminate several layers of the thermoplastic material, the solvent should be brushed or preferably sprayed over the entire surface. The second sheet is then placed into position on the first and its exposed surface treated with solvent in a similar manner. After the required number of layers have been so treated, they are placed in a press between highly polished press plates. The laminating cycle is completed at a pressure of 200 to 300 p.s.i. and a temperature of 250 to 300° F. for 10 to 15 minutes.

It must be understood, that wherever heat and pressure is used in cementing, additional finishing operations will be required. The action of the heat on the solvent will cause it to expand, and, due to the fact that the parts are held rigidly together, this expansion will be at right angles to the source of pressure. Therefore, there will be a bulging of the material apparent at all exposed edges of the bonded joint. This bulge must be removed by sanding and machining.

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for Plaskon plant expansion

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The new Plaskon five million dollar plant will stimulate greater research, experiment and development in the synthetic resin field; will permit vast expansion in the production of Plaskon molding compounds, coating resins, resin glues and special industrial resins; and will open greater opportunities for Plaskon service to the molder, fabricator and industry in general.

Plaskon Materials today include urea-formaldehyde and melamine-formaldehyde plastics for molding a wide variety of useful products; resin glues and laminating resins for bonding, veneering or laminating wood, paper, fabrics, glass fibers and other materials; coating resins for the paint and varnish industry; and specialty resins for new and unusual uses.

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Selecting a hinge or latch design

There are three broad categories of hinges that can be used effectively with plastic parts—piano-type hinges, spring hinges and pin hinges

ONE-PIECE construction in plastic parts, while simplest from the point of view of design, is obviously impossible of achievement in a multitude of cases. Consequently, methods of assembling one or more parts are essential knowledge to every molder and fabricator. On pages 167 through 171 of this issue cementing is discussed in detail—one means of assembling the components of a plastic part into permanent and fixed relationship. Then there are cases where provision must be made for quick and simple assembly and disassembly. The subjects concerning us in this article, however, are methods of hinging and latching.

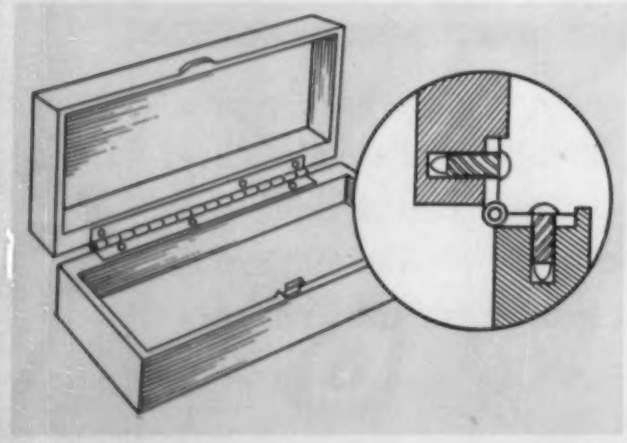
Piano hinges with drive screw assembly

The full piano hinge held either with drive screws or with rivets gives, no doubt, the neatest and best hinging. Figure 1 shows a rectangular box with a piano hinge assembled by means of drive screws. These screws are driven into holes which have been drilled after molding or been molded directly into the plastic. For high production assembly of this type, it is far more satisfactory to mold the holes in, since the diameter of the holes must be held within a very close tolerance—actually closer than can be held by fast production drilling. As a matter of fact, for proper assembly, a "go" and "no go" gage used for checking these holes should have no greater maximum tolerance than 0.002 inch.

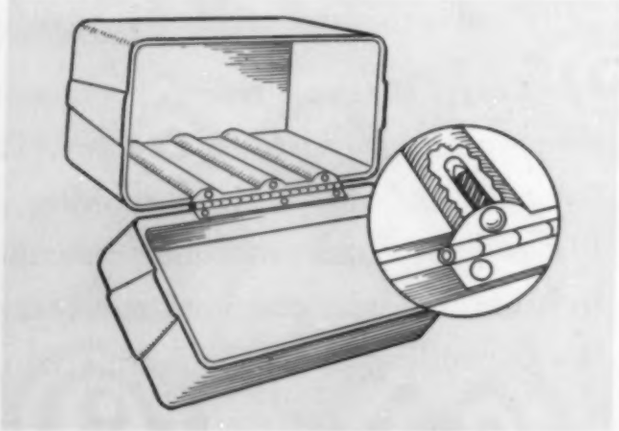
The assembly of this hinge is essentially a manual operation. The drive screws may be handled with a magnetized center punch, the end of which has been machined to fit closely the head of the drive screw. The operator merely touches the punch to the head of the screw and, due to magnetic attraction, the drive screw adheres to the center punch and is, therefore, easily placed into position over the hole and driven home with a light tap of a small hammer.

A variation of the piano hinge is the special cut-out type shown in Fig. 2. In this case, the cover of the box is molded of urea material. Due to price considerations, the wall section is held to a minimum—this minimum being insufficient to support the stresses occasioned by driving the assembly drive screws into the thin section. For this reason, half round ribs are designed in the cover and the hinge is stamped out to fit. These ribs permit the molding in of the assembly holes and provide sufficient material to support the stresses applied by the drive fit of the screw.

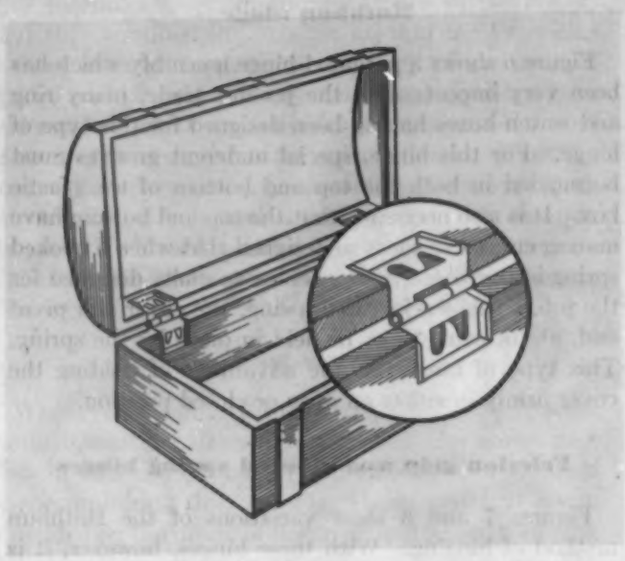
The use of piano-type hinges of this kind is probably one of the more expensive methods of hinging plastic boxes. Take, as an example, a piano hinge, 3 in. long by $^3/_8$ in. wide, made from 0.016-in. brass stock finished with basket nickel plate and barrel polished. On the basis of prewar prices, this hinge costs approximately $12 per thousand, while $^3/_{16}$ by 00 drive screws with the same finish averaged approximately $1 per thou-



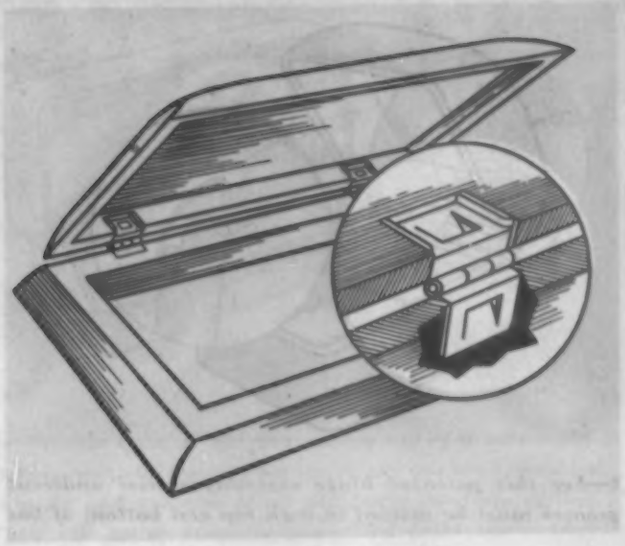
1—When a full piano hinge such as this is used to assemble a plastic box, it is preferable for the holes to be molded in, since in this way they can be held to closer tolerances than is possible with fast drilling



2—Where the wall section of a box is held to a minimum because of price considerations, this special cut-out piano hinge can be used. One side of the metal hinge is stamped to match the half round ribs of plastic



3—In this specialty hinge, which is a variation of the piano hinge, two protruding points engage with undercut protrusions molded into the halves of the box. Molded-in slots engage outside edges of these hinges



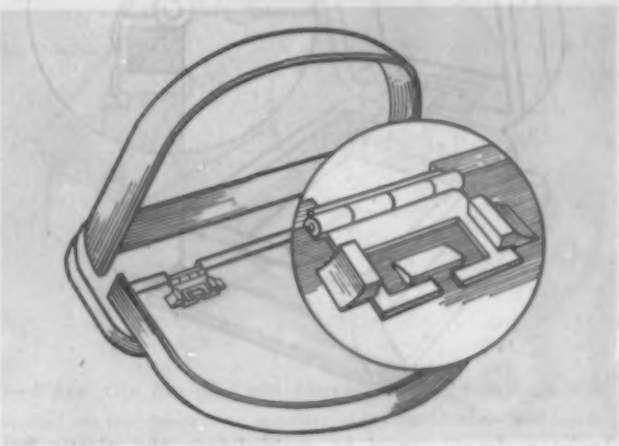
4—This hinge is much like the one in Fig. 3 except that the locking lugs are of a different design. The end effect is to give an assembly that is slightly more rigid, an important consideration in some applications

sand. Combining the cost of six drive screws and one hinge made a total of $18 per thousand assemblies. A direct labor piece rate charge of $3 per thousand for assembling the six screws and hinge to the box coupled with 100 percent overhead made a labor and overhead charge of $6 per thousand. The total, therefore, for material and assembly labor and overhead now becomes $24 per thousand, or approximately 2 1/8 cents each—this, of course, does not include profit. If the reader wishes to make comparisons between prewar and current labor overhead, he can base his estimates of the cost of hinging a box on the fact that a labor rate of 60 cents per hour was used in figuring the above mentioned prices.

Specialty hinges with unique anchorage

Less expensive, at the prewar prices used in our estimates, are the special designs of self-gripping piano hinges, shown in Figs. 3, 4 and 5. In each of these, special pins must be incorporated in the die to mold the required slots and lugs for locking the hinges in place. In the hinge picture in Fig. 3 two protruding points engage with undercut protrusions, which are molded in the top and bottom of the box, to anchor both halves of the hinge. These protrusions must be designed so that they will properly strip when the part is ejected from the force plug. Molded-in slots engage the outside edge of these hinges in order to complete the permanent assembly.

The hinge in Fig. 4 is similar to the one just described except that the locking lugs on this hinge have a somewhat different design and actually give a slightly more rigid assembly. Still another special design can be seen in Fig. 5. Two lugs molded into the plastic cover have molded grooves which engage the outside of the

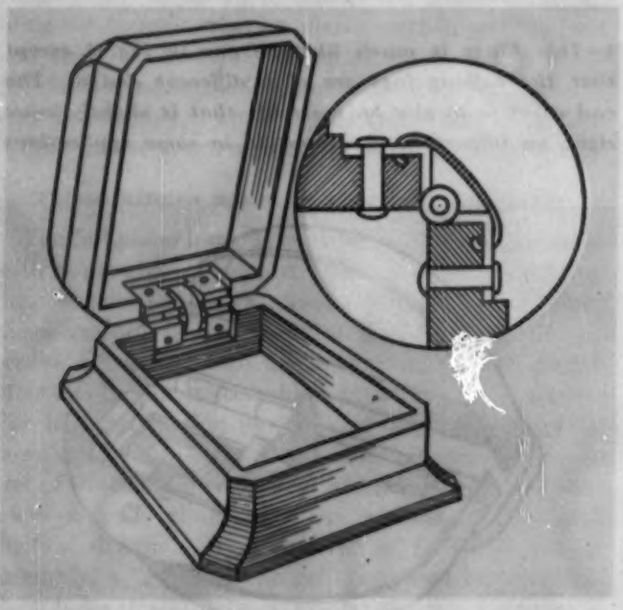


5—In this specialty hinge, lugs molded into the cover have grooves that engage the outside of the hinge; a third lug locks the cut-out legs of the hinge behind it

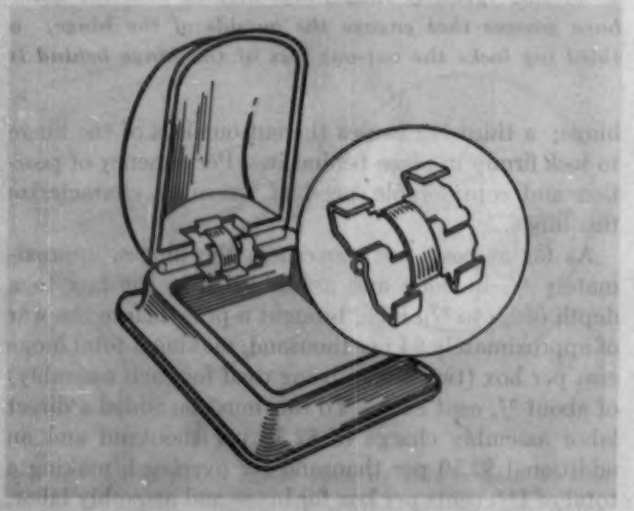
hinge; a third lug causes the cut-out legs of the hinge to lock firmly in place behind it. Permanency of position and considerable speed of assembly characterize this hinge.

As far as costs are concerned, the hinges, approximately 3/8 in. long and assembled into the box to a depth of 1/4 to 5/16 inch, brought a price before the war of approximately $4 per thousand, making a total hinge cost per box (two hinges being used for each assembly) of about 3/4 cent each. To this must be added a direct labor assembly charge of $2.50 per thousand and an additional $2.50 per thousand for overhead, making a total of 1 1/4 cents per box for hinge and assembly labor. Again, in this case, a labor rate of 60 cents per hour was used to figure the costs. (*Please turn to next page*)

6—For this patented hinge assembly special undercut grooves must be molded in both top and bottom of box



7—No undercuts need be molded into the plastic box to accommodate this riveted spring type of hinge



8—This friction grip spring hinge is like that in Fig. 7 except that the slots are molded vertically

Rathbun hinge

Figure 6 shows a patented hinge assembly which has been very important to the jewelry trade, many ring and watch boxes having been designed for this type of hinge. For this hinge, special undercut grooves must be molded in both the top and bottom of the plastic box. It is also necessary that the top and bottom have mating curved surfaces so designed that when a hooked spring is assembled by a machine specially designed for the job, as shown in the drawing, the cover will pivot and, at the same time, be held in place by the spring. This type of hinge has the advantage of holding the cover firmly in either an open or closed position.

Friction grip and riveted spring hinges

Figures 7 and 8 show variations of the Rathbun method of hinging. With these hinges, however, it is not necessary for any undercuts to be molded in the box parts. The hinge is assembled to both the top and bottom of a box by means of rivets inserted in four holes drilled into the plastic walls. For the hinge shown in Fig. 7, no special mold design is necessary with the exception of slight recesses being molded to accommodate the piano hinge. The snap spring is then hooked into position on the hinge. As mentioned previously, the action then is somewhat similar to the patented Rathbun hinge.

Except for the fact that the slots are molded vertically in both the top and bottom of the box, the hinge shown in Fig. 8 is like that in Fig. 7. Sufficient wall section is provided so that a friction fit is obtained by means of the four assembled lugs shown in the enlarged view of the hinge. All three hinges shown in Figs. 6, 7 and 8 operate so that the cover is held firmly in either an open or closed position.

Cotter pin or rivet hinges

Other types of hinging are accomplished without the use of the piano type of hinge. One, a very simple job, makes use of a cotter pin (Fig. 9). The top and bottom of a box are assembled in a jig and the two hinge pin holes accurately drilled. Two cotter pins are then assembled in these holes from the outside, the ends being spread open from the inside to make a permanent assembly and a fairly satisfactory job. The cost of this type of assembly is very low, and for inexpensive jobs is to be highly recommended. Rivets can be substituted for the cotter pins, making an equally satisfactory hinge and permitting automatic assembly through the use of riveting machines.

Lug and pin hinges

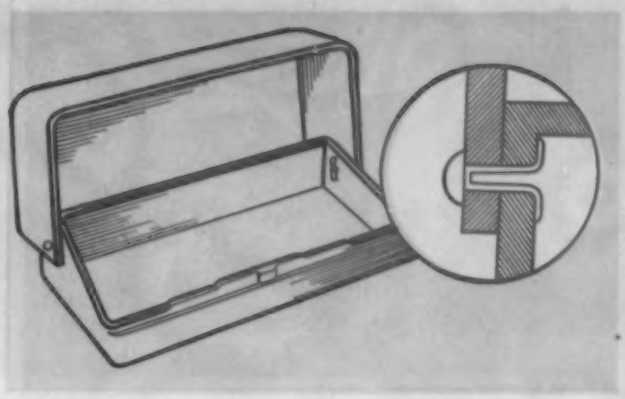
Another type of assembly is known as the lug and pin hinge (Fig. 10). In this case, two lugs are molded on the cover and mating slots are molded in the back wall of the bottom of the plastic box. The top is then placed in position on the bottom and, by means of a

drill jig, holes are drilled in both ends of the box so that they continue through the lug and the cover and a short distance further into the back of the box. A special screw machine pin, sometimes used with a head and sometimes not, has a diamond knurl raised on part of its length as shown in the enlarged view. With the cover and bottom properly assembled, this pin is driven into the drilled hole, and is held firmly in this position by the drive fit of the knurl in the bottom of the box. The cover pivots on this pin as shown in the drawing. This method, like that in Fig. 9, is very cheap.

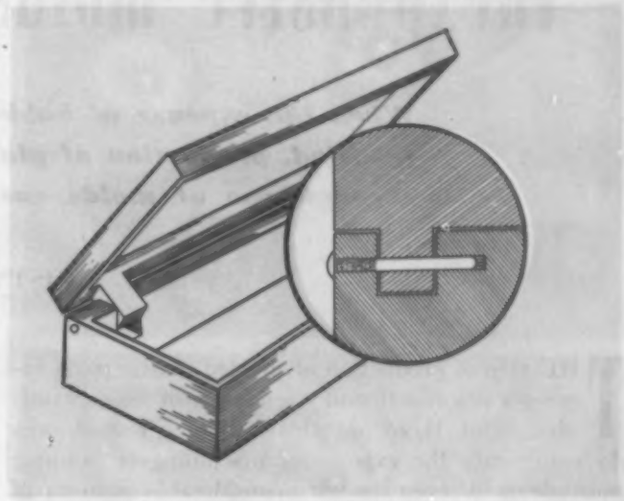
Latching methods

Whenever a hinge without a spring is used, some method must be devised for keeping the cover in a closed position. Figures 11 and 12 show two methods of accomplishing this. In Fig. 11, an undercut bump is molded on the inside of the cover and a corresponding slot is either molded or ground on the outside of the bottom. When rigid materials are used, assembly must be accomplished with great accuracy.

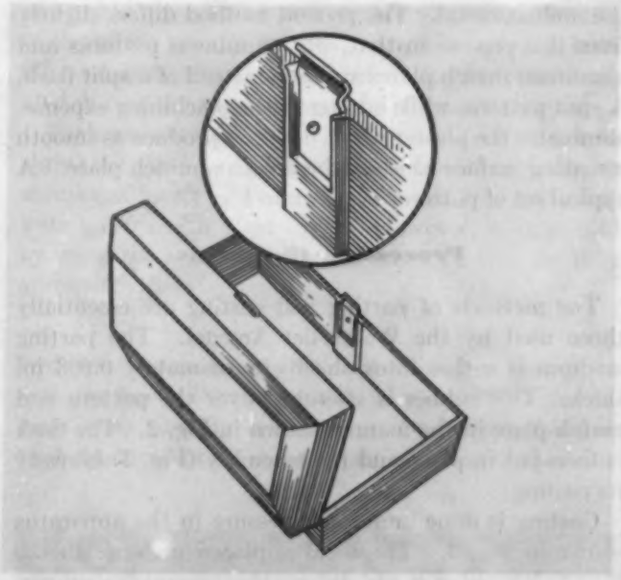
Another method, shown in Fig. 12, allows for greater variation in the closed location of the top and bottom. In this case, a clip of flexible spring brass is stamped out so that the upper portion has a rounded undercut and the body has a sharp protrusion. A vertical slot is molded in the bottom of the box. The spring clip is then assembled in this slot, and held rigidly in position by the sharp protrusion. An undercut bump is molded in the proper location in the cover so that it will engage with the spring clip. Slight variations in the relative locations of the top and bottom of the box can be compensated for by bending the spring clip either forward or backward.



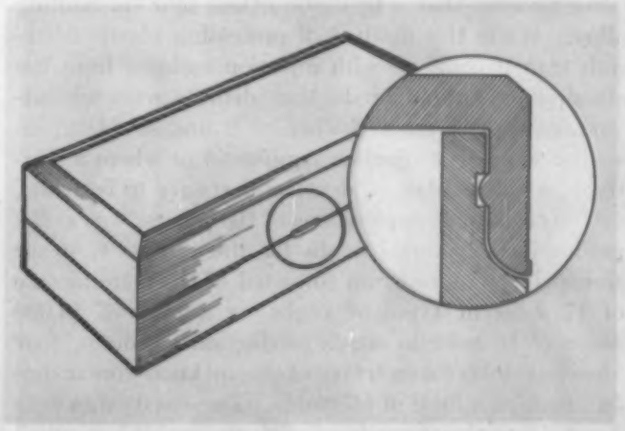
9—Another type of hinging makes use of a cotter pin. In this case, the top and bottom of the box are assembled in a jig and the two hinge pin holes carefully drilled. Then the cotter pins are assembled from the outside



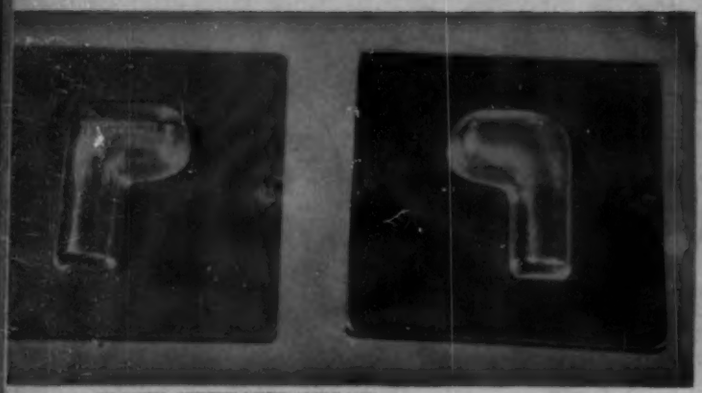
10—When the lug and pin hinge is used, two lugs are molded on the cover and mating slots molded in the back wall of the bottom. Holes are then drilled through the lug and box bottom, and a special pin driven into place

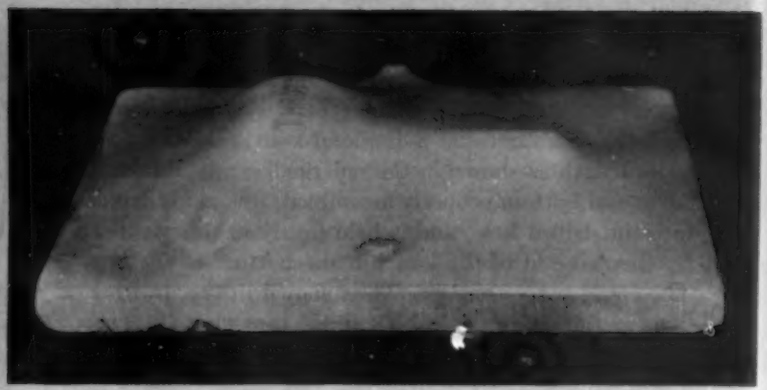


12—In this method of latching, a spring clip is assembled in a vertical slot molded in the bottom of the box. An undercut bump molded in the cover engages this clip



11—A method of latching is necessary whenever a box is assembled with a non-spring type hinge. Here an undercut bump on the inside cover mates with slot in the bottom





ALL PHOTOS, COURTESY CURTISS-WRIGHT CORP.

1—This method of casting molds makes use of aluminum pattern and match plate instead of a split flash

2—A thin rubber sheet, used as a parting medium, is carefully stretched over the pattern and match plate

Inexpensive molds for cast plastics

When the expense of hobbed or machined molds is not justified, production of plastic parts can be accelerated through use of molds cast of low-melting point alloy

by PAUL FROST* and L. W. SMITH†

THE rate of production of molded plastic parts increases as a function of the number of molds available. But there are times when circumstances do not justify the expense of machining or hobbing multiple molds even though a considerable quantity of articles are needed.

It is for just such cases that the Cornell Aeronautical Laboratory has developed a plastic casting process whereby it is possible to produce any number of molds at a very low cost by utilizing the first step of the precision process, that is by casting them in a low-melting alloy. While this method of processing plastic materials cannot compare with injection molding from the standpoint of rapid production, definite economic advantages can be realized where it is undesirable to invest in expensive injection equipment or where a relatively small number of identical parts are to be made.

One of the first applications of the process was in the production of control knobs for the Curtiss C-46 air transport. The program consisted of the manufacture of 17 different types of knobs, or a total of 19,000 pieces. In order to satisfy production schedules, four identical molds for each type of control knob were manufactured, or a total of 68 molds. Two-cavity dies were decided upon as a means of cutting down the required manhours to an economical figure. Figures 1, 2, 3 and 4 offer a pictorial description of the making of these molds.

* Former metallurgist, Metallurgical Sect., Cornell Aeronautical Laboratory.
† Head, Metallurgical Sect., Cornell Aeronautical Laboratory.

In the precision casting processes of which descriptions have been published at an earlier date, the mold is cast around a pattern embedded to its parting line in plaster. A split flash is used—the drag holding the plaster embedded pattern and the cope receiving the molten metal. The present method differs slightly from this process in that split aluminum patterns and aluminum match plates are used instead of a split flash. A split pattern, while adding to the machining expense, eliminates the plaster which does not produce as smooth a mating surface as is obtained with a match plate. A typical set of patterns is shown in Fig. 1.

Processing the molds

The methods of parting and casting are essentially those used by the Watervliet Arsenal. The parting medium is a thin latex sheet approximately 0.003 in. thick. This rubber is stretched over the pattern and match plate in the manner shown in Fig. 2. The flask is then put in place and the assembly (Fig. 3) is ready for casting.

Casting is done under air pressure in the apparatus shown in Fig. 4. The mold is placed underneath the funnel located directly below the pressure chamber. The cover is then screwed down tight and air pressure up to 10 or 20 p.s.i. applied to exhaust the air trapped between the rubber parting and the pattern. Finally, the holding crucible, previously filled with a measured

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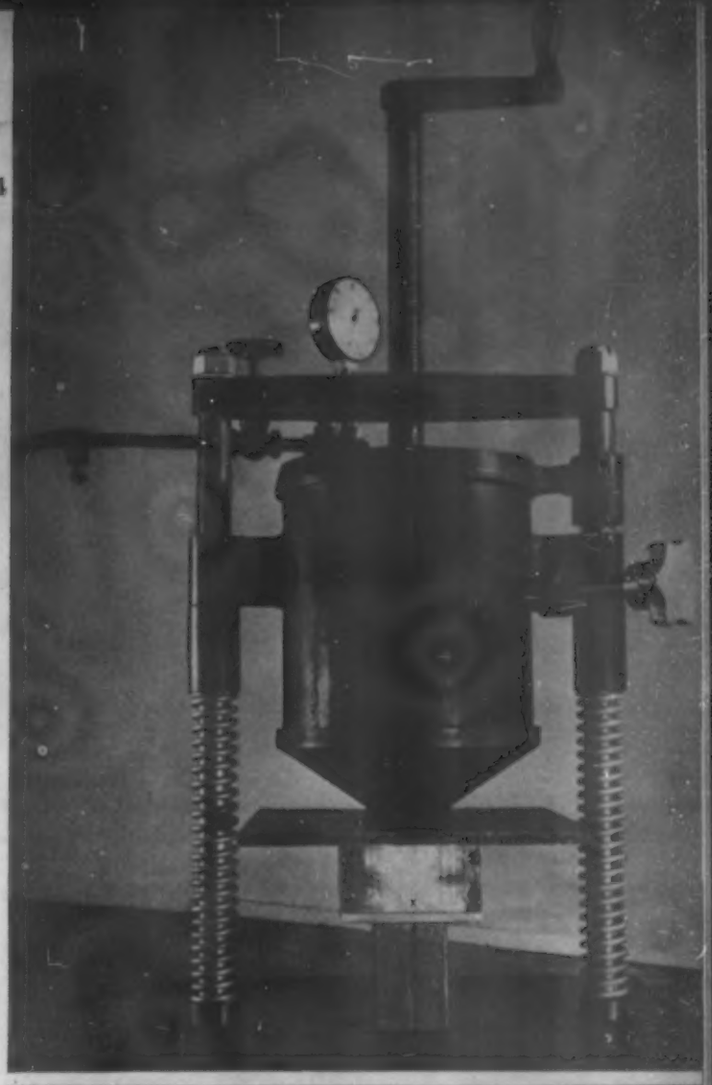

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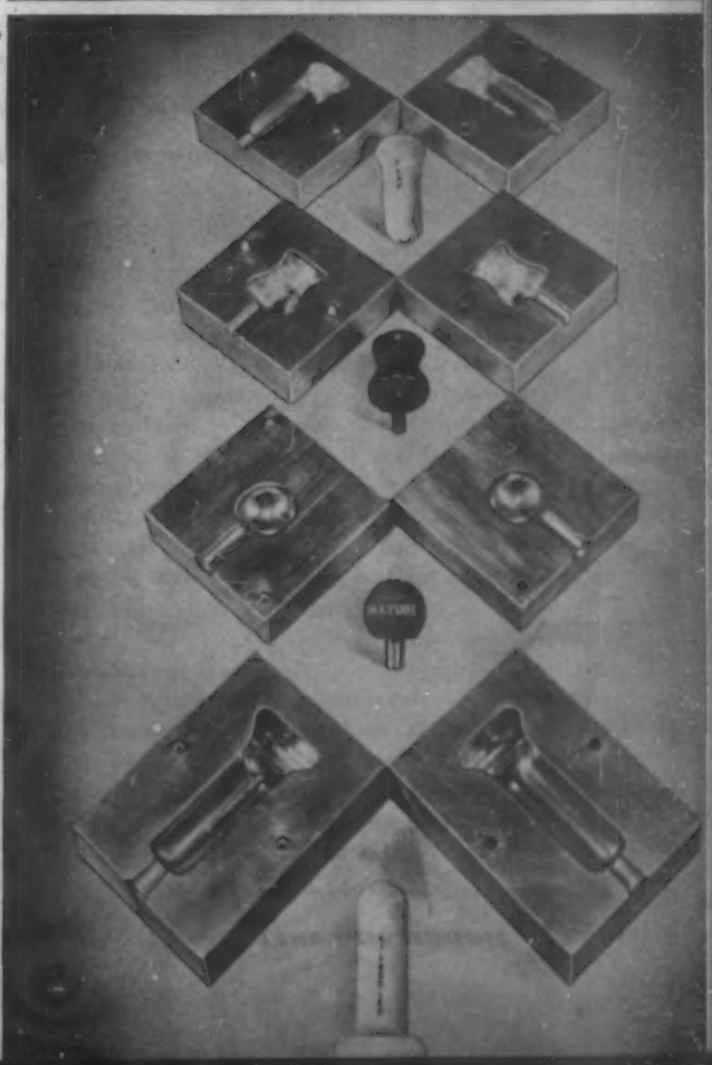
3—This pattern, covered with the rubber parting sheet is mounted ready for casting. 4—In making these molds, pressure casting apparatus of this type is used. Here flask is shown in position to receive molten metal

quantity of metal, is inverted by means of the knob shown at the right in Fig. 4. At the same time the air pressure is increased to approximately 80 p.s.i. This pressure insures accurate reproduction of the lettering engraved on the pattern.

After a few minutes the pressure is released and the mold assembly removed. When both halves of a mold have been cast, they are pinned and gated. The surface of the cavity is so smooth that little or no polishing is necessary before the mold is used. Figure 6 shows a complete mold made from the patterns of Fig. 1. One of the plastic control knobs is shown between the mold halves. Four other molds with their plastic products are shown in Fig. 5.

The alloy used throughout the project contains 46 percent lead, 6 percent bismuth, 40 percent tin and 8 percent antimony and has a solidification range from 330 to 318° F. This is somewhat higher than the range of the alloys ordinarily used in precision casting, but it afforded a greater factor of safety for the heat generated during the polymerization of the casting resin.

Patterns were designed to allow for a 2 to 4 percent shrinkage in the resin control knobs and a 6 percent shrinkage in the cast molds. Tolerances strived for were 0.030 in. in most cases. However, it is possible by using the same technique to meet much closer tolerances than these.



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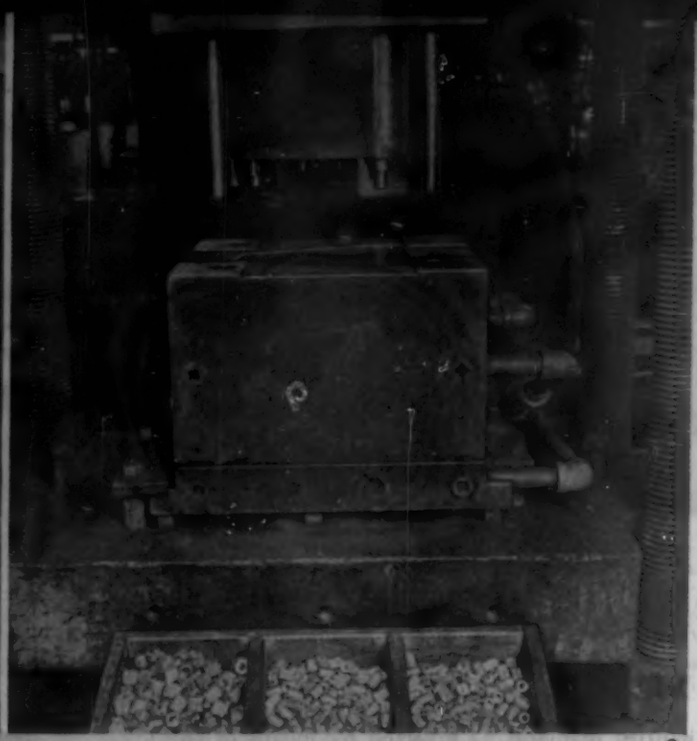
5—Several examples of cast molds are here contrasted with the knobs that were made in them. 6—A finished mold after pinning and gating. The throttle control knob produced in this casting die is shown in the center

6

ALL PHOTOS, COURTESY SPECIALTY INSULATION MFG. CO., INC.

1



2

1—Each of the parts (lower left) requires two preforms (above) of rag-filled material weighing 1 lb. 12 oz. 2—The production of these parts in this mold was increased about four times through the use of high-frequency preheat

High-frequency preheating

The preheating of thermosetting plastic material used in compression molding has had a marked effect upon the quality of the end product

by A. R. TINNERHOLM*

JUST what has been the effect of high frequency preheating of thermosetting materials? There seems to be a question in the minds of some members of the plastics industry as to whether the recent advances in the art of compression molding can be attributed primarily to the use of high-frequency preheating or to the development of *new* methods. It might help to resolve this uncertainty to point out that the bulk of the thermosetting molding is done by the compression method and to detail a few instances where the use of high-frequency preheating has resulted in a much improved plastic part.

One of the more difficult problems to confront the molder has been the production of medium- to large-sized molded parts made of rag-filled thermosetting materials. High-frequency preheating has greatly simplified this problem, as for example in the case of the molded part shown in Fig. 1. Before the advent of high-frequency preheating this was a difficult part to produce. Using a total of 1 lb. 12 oz. of material, the part is $1^3/_4$ in. thick at its heaviest section. Best results were obtained using two 5-in. preforms.

When a steam table, infrared light or electric oven is used to preheat the material, the press is 6 to 7 min. in closing and the cure consumes 45 minutes. In contrast, the same material can be properly preheated in 90 sec. if a 2-kw. high-frequency preheater is employed. Further, the press closes without noticeable hesitation when the plastic is heated in this manner and a thorough cure, laboratory checked, is achieved in 7 minutes.

Since there is considerably less strain on the insert pins when high-frequency preheating is employed, the plant is able to maintain almost continuous three-shift production. This acts to increase the production of a single mold from 125 pieces to 480 pieces per week. And there is, in addition, considerably less spent on the repair of the mold in the tool room.

The finishing of the part is also facilitated since the use of high-frequency preheated material acts to reduce

* Assistant manager, Specialty Insulation Mfg. Co., Inc.

3

4

3 and 4—Molding of this part on the compression press shown at right is complicated by inserts. In this case, high-frequency preheating of the 7 preforms has resulted in almost negligible spoilage from the displaced inserts

the cut-off burr from 0.030 or 0.035 in. to 0.008 or 0.010 inch. Cleaning and retapping is made easier due to the fact that the inserts are cleaner and straight. In all, the appearance of the part is much improved.

The use of this type of preheating also makes itself felt on the type and size of press equipment that can be used on any specific part. For example, the piece shown in Fig. 1 can be handled with ease in a 12-in. ram press (2500 p.s.i. line pressure) when the material is preheated by high frequency. Without it, a 15-in. press must be employed.

While the advantages to be derived from the use of high-frequency preheating, as cited above, are not exceptional, they do indicate the improved quality that can be expected in compression-molded parts that make use of high-frequency preheated rag-filled plastic material. And since the quality of the finished article and the cost of the mold have a marked influence upon the method of molding selected for the processing of any given item, the increased use of high-frequency preheating can be expected to extend the field of application for compression molding.

Multiple cavity compression molding

Another instance in which use of high-frequency has increased the production, is shown in Fig. 6 where the part, which has an O.D. of $^{11}/_{16}$ in. and is produced of a Bakelite medium-impact phenolic material, is contrasted with its preform. The 98-cavity mold, which is run in a 12-in. press, has established production records of slightly over 48,000 pieces for a 3-shift day, or a total of better than a million parts per month with the plant running 3 shifts a day, 5 days a week.

You will note from Fig. 7 that the mold is of the

5—For maximum efficiency and quality, high-frequency preheating equipment should be positioned adjacent to the press so there is no danger of preforms cooling off

subcavity type, seven pieces being molded in each subcavity. The preform is so designed that one pill takes care of each subcavity. The operation has been set up so that 14 preforms are placed in the high-frequency preheater at one time. The cycle of production is fast enough to enable one operator to keep busy running this mold alone.

For the size of the part produced, this compression mold and 12-in. ram press are turning out an admirable quantity of good pieces. It should also be mentioned that the thinness of the cut-off (0.004 to 0.005 in.) makes practical the finishing of these parts by tumbling only. This would not be possible if high-frequency preheating were not used.

Multiple cavity molds, containing long slender pins, have been difficult to mold by the compression method without the spring boxing of the pins, an operation which adds to the cost of the mold and also increases the parts price due to the adding of an operation to the molding cycle.

Figure 3 shows a molded piece containing interesting inserts. A compression mold is used for the production of this part. It has been found that through the use of high frequency preheating the spoilage from displaced inserts is negligible. At present this rather complicated mold is producing over 1500 parts per week; and it is also being run with another mold.

We have limited our discourse in this article to the use of high-frequency preheating for the thermosetting materials. We should add that many advantages are gained when high frequency is used with such other methods as transfer molding and variations thereof.

By way of recapitulation we are listing some of the advantages gained by the use of high frequency preheating in conjunction with compression molding.

1. Increased production.
   a. Decrease in cure time up to four-fifths.
   b. Molds can be run in smaller, faster presses.
   c. Press closes without hesitation, increasing speed of cycle.
2. Less mold repairs.
   a. The soft putty-like condition of the materials, when preheated by high-frequency, causes the mold to be filled with minimum stress.
   b. Molds can be run in smaller presses and with less pressure.
3. Less material can be used as less material is required in the preform to make a dense molded part.
   a. A smaller amount of flash relief can be used.
   b. A thinner cut-off is maintained.
4. Fewer defective pieces are produced.
5. Finishing costs decreased.
   a. The cut-off burr is much thinner, in many cases thin enough to permit finishing by tumbling.
   b. When tumbling is impractical due to inserts or fragility of the molded part, the thin cut-off burr often permits removal by buffing.
6. In some cases high-frequency preheating permits the use of general-purpose material and this eliminates the use of higher priced special materials.
7. Applications that require the strength of rag-filled type materials but are somewhat intricate in design can now be successfully molded.
8. There is an improvement in the appearance.

6 and 7—Using high frequency heated preforms this 98-cavity compression mold turns out about 48,000 parts in three shifts. The mold is of the sub-cavity type, 7 pieces being molded in each sub-cavity from one preform

6

7

Beauty and Utility

IN PLASTICS and METALS

Important to all designers is the fact that plastics, metals, and plastic-metal combinations are being produced entirely under one roof by the Bay Manufacturing Division of Auto-Lite. Such examples as this Fifth Avenue Medallion, a finely designed plastic casting mounted on a chrome-plated and decorative bezel . . . the vinylite plastic grommet and nipples (vinylite does not require the heavy walls of rubber products) . . . the etched enamel-filled high polished chrome escutcheon . . . typify fine Auto-Lite craftsmanship.

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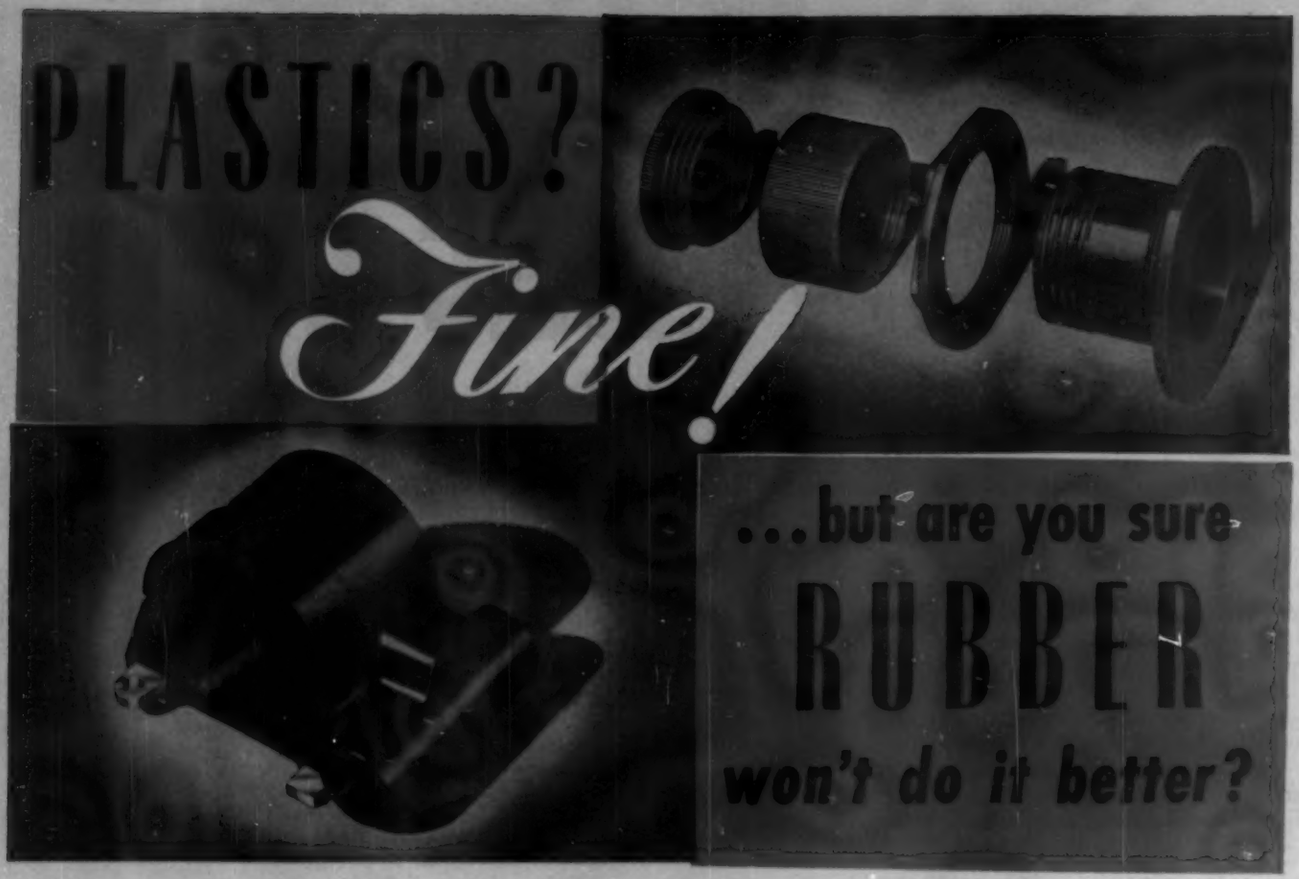
SKIN SECTIONS and bulkhead panels of these 310-gallon plywood jettison fuel tanks for fighter planes, made by the Gillespie Furniture Co. of Los Angeles, were bonded with Cyanamid's MELURAC* resin adhesive 300. Nose, center, and tail units are made of five layers of single-ply veneer, sprayed with MELURAC 300, shaped and cured for 7½ minutes at 260°F. and 200 psi, in curved molds. MELURAC is also used to bond the veneer to form the ten bulkhead panels for the tank skeleton. Tanks are unaffected by heat and cold, are immune to moisture, fungi, and insect attack. Weight is approximately ½ pound per gallon capacity.

*Reg. U. S. Pat. Off



The answer is the best material for your part or product. We have the facilities to help you pick the right material or develop a specific rubber or plastic compound for your job

Here's a case where rubber worked better

IN the problem of selecting the right material for an electrical connection coupler with a difficult range of specifications, painstaking research on both rubber and plastics finally resulted in the development of a special compound which met all requirements. At first, a combination of metal and phenolic parts to meet the electrical and physical specifications was tried out, but, under test, it was found that the coupler shorted when it was subjected to water or damp weather. Various rubber compounds were tested but none of the compounds available at the time had the range of physical characteristics necessary to meet all field and connection conditions. Our laboratory then developed a special rubber compound with the specific compressibility for a tight seal and other physical characteristics for a varied field service in addition to the specifications of high dielectric strength, very low permanent set and low power factor.

There are many other cases where synthetic or natural rubber works better than any of the newer plastics. Nothing has yet been developed to beat the over-all properties of hard rubber in water meter applications, for instance, particularly dimensional stability and high resistance to moisture and solvents. And in addition to its slow water absorption rate and high softening point, hard rubber has the advantage of easy machinability. The same reasons hold true for its choice in many applications in other fields where it withstands submersion and exposure to gases much better than newer plastic materials.

Rubber, one of the oldest plastics, has, with the development of synthetic formulas, become one of the newest. With the return of adequate quantities of natural rubber to the market, the position for the synthetic changes from a wartime substitute to one having advantageous qualities of its own. Its ability when properly compounded to withstand extreme cold without stiffening, and its exceptional resistance to certain solvents, make it the best material for products exposed to gasoline, oils and acids.

Special soft rubber compounds available or developed

We have developed compounds to ASM and ASTM specifications and it may be that just the material you need is among the many highly specialized compounds we have available. If you have a problem involving the use of soft rubber or want to replace an ordinary compound with a specific compound for the job, we are in a position to help you.

We have large scale transfer, extrusion and compression manufacturing facilities, precision fabrication to commercial or special tolerances in rods, tubing sheets, or molded rubber products.

IN SOME CASES HARD RUBBER WORKS BETTER . . .

	Thermal Setting Molding Compositions							Thermal Plastic Molding Compositions				
	Phenol-Formaldehyde Woodflour Filler	Phenol-Furfural Woodflour Filler	Urea-Formaldehyde Alpha Cellulose Filler	Melamine-Formaldehyde Alpha Cellulose Filler	Hard Rubber High Grade (Ebonite)	Hard Rubber Medium Grade	Hard Rubber Low Grade	Methyl-Methacrylate Molding Powder	Polystyrene Molding Powder	Ethyl-Cellulose Molding Powder	Cellulose-Acetate Molding Powder	Cellulose-Acetate Butyrate Molding Powder
Specific Gravity	1.32-1.47	1.30-1.40	1.45-1.50	1.45-1.55	1.17-1.25	1.20-1.30	1.30 up	1.16-1.20	1.054-1.070	1.07-1.18	1.27-1.37	1.10-1.24
Tensile Strength, lbs. per sq. in.	6,500-9,500	5,000-8,500	8,000-13,000	6,000-13,000	7,000-9,500	3,500-7,000	1,500-3,500	4,000-10,000	5,000-9,000	2,000-9,000	1,500-8,500	1,400-6,700
Elongation, %	0.4-0.8	—	—	—	2.5-6.0	1.5-3.5	1.0-2.5	1-15	2-5	5-100	7-90	25-95
Compression Strength, lbs. per sq. in.	25,000-36,000	28,000-36,000	25,000-30,000	27,000-37,000	12,000	9,000	6,000-9,000	10,000-15,000	11,500-15,000	8,000-20,000	5,000-30,000	7,500-23,000
Flexural Strength, lbs. per sq. in.	9,000-12,000	8,000-13,000	10,000-14,000	10,000-16,000	15,000	10,000	7,500	10,000-19,000	8,000-14,000	2,000-13,000	3,000-12,000	1,600-13,000
Impact Strength, ft. lbs. per in. ½ x ½ in. notched bar, Izod Test	0.24-0.40	0.26-0.40	0.28-0.32	0.24-0.35	0.30-0.35	0.20-0.30	0.14-0.20	0.2-0.4	0.3-0.5	0.6-11.5	0.6-6.2	0.6-9.2
Hardness, Rockwell	M110-M120	M65-M75	M110-M130	—	M95-M105	M85-M100	M85-M100	M60-M112	M75-M90	R20-R110	R70-R120	R60-R120
Distortion under Heat °F (Softening Point)	260-300	270-290	260-280	285	140-150	140-150	140-150	145-190	170-175	130-200	100-215	100-180
Dielectric Strength, short-time volts per mil, ⅛ in. thickness	250-375	325-550	300-400	300-400	470	440-470	320-440	500	500-700	400-660	250-365	250-400
Power Factor, 60 cycles	0.03-0.30	0.04-0.28	0.029-0.032	0.043-0.045	.006	.004-.006	.006	0.05-0.07	0.0001-0.0003	0.005-0.015	0.01-0.06	0.01-0.04
Water Absorption, 24 hrs., percent	0.4-1.0	0.2-0.6	0.5-0.7	0.3-0.6	0.02	0.02	0.02 Variable	0.3-0.5	0.00-0.03	1.0-2.0	2.0-6.0	1.0-2.4
Burning Rate	Very low	Very low	Very low	Nil	Slow	Slow	Slow	Slow	Slow	Slow	Slow	Slow
Effect of Sunlight	Light shades discolor	Light shades discolor	None	Slight color change	Discolors	Discolors	Discolors	Very slight	Yellows slightly	Slight	Slight	Slight
Effect of Weak Acids	None to slight depending on acid			None	None	None	None	Practically nil	None	Slight	Slight	Slight
Effect of Strong Acids	Decomposed by oxidizing acids. Slight effect by reducing and organic acids.		Decomposed at surface attacked	Decomposes	Decomposed by oxidizing acids. Little affected by others			Affected by oxidizing acids.		Decomposes	Decomposes	Decomposes
Effect of Weak Alkalies	Slight to marked depending on alkalinity			None	None	None	None	Practically nil	None	None	Slight	Slight
Effect of Strong Alkalies	Decomposes	Decomposes	Decomposes	Attacked	None	None	None	Practically nil	None	Slight	Decomposes	Decomposes
Effect of Organic Solvents	None on blood-proof materials			None	Insoluble	Insoluble	Insoluble	Soluble	Soluble	Soluble	Soluble	Soluble
Effect of Metal Inserts	Inert	Inert	Inert	Inert	Inert	Inert	Inert	Inert	Inert	Inert	Inert	Inert
Machining Qualities	Fair-Good	Fair-Good	Fair	Fair	Excellent	Very Good	Good	Excellent	Fair-Good	Good	Good	Good
Clarity	Opaque	Opaque	Translucent-Opaque	Translucent	Opaque	Opaque	Opaque	Transparent 90-92% Light Transmission	Transparent 88-92% Light Transmission	Transparent, Translucent, Opaque		
Color Possibilities	Limited	Limited	Unlimited—Pastel Shades	Unlimited	Limited	Limited	Limited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited
Molding Qualities	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Mold Shrinkage, in. per in.	0.006-0.010	0.005-0.009	0.006-0.011	0.008-0.015	S.C. .016-.018 S.C. .020-.022	S.C. .016-.018 S.C. .020-.022	S.C. .016-.018 S.C. .020-.030	0.003-0.006	0.002-0.008	0.001-0.011	0.002-0.005	0.002-0.005

The advantages of selecting a molder with facilities for both rubber and plastics.

The problem of material selection for a part or product is not always easy in these days of rapid advance. New and better plastics are constantly being developed as are new compounds in synthetic and natural rubber. The best material for your part or product depends on the job it has to do from appearance to performance.

Just as it made sense for us with 60 years of molding experience to go in for the newer plastics, it also made sense to continue our research and fabrication in rubber. We therefore believe we are in a good position to help you find the latest and best material or, should your product require it, develop a special plastic or rubber compound for the job.

We have completely equipped and staffed chemical and physical laboratories for all the necessary research and testing to match the wide range of plastic and rubber materials against the specifications dictated by the mechanical, chemical, optical, electrical and fabrication requirements your product may have to meet.

Our experienced staff of engineers and technicians have helped in the development of many plastic and rubber products for various industrial and commercial fields.

Complete service

Not only will our engineering staff help you find the latest and best plastic or rubber material for your part or product but it is very likely that our research assistance and facilities for efficient, large scale production will fill your needs at reasonable cost. If you would like to have an engineer call to discuss your needs, please write Dept. C-2.

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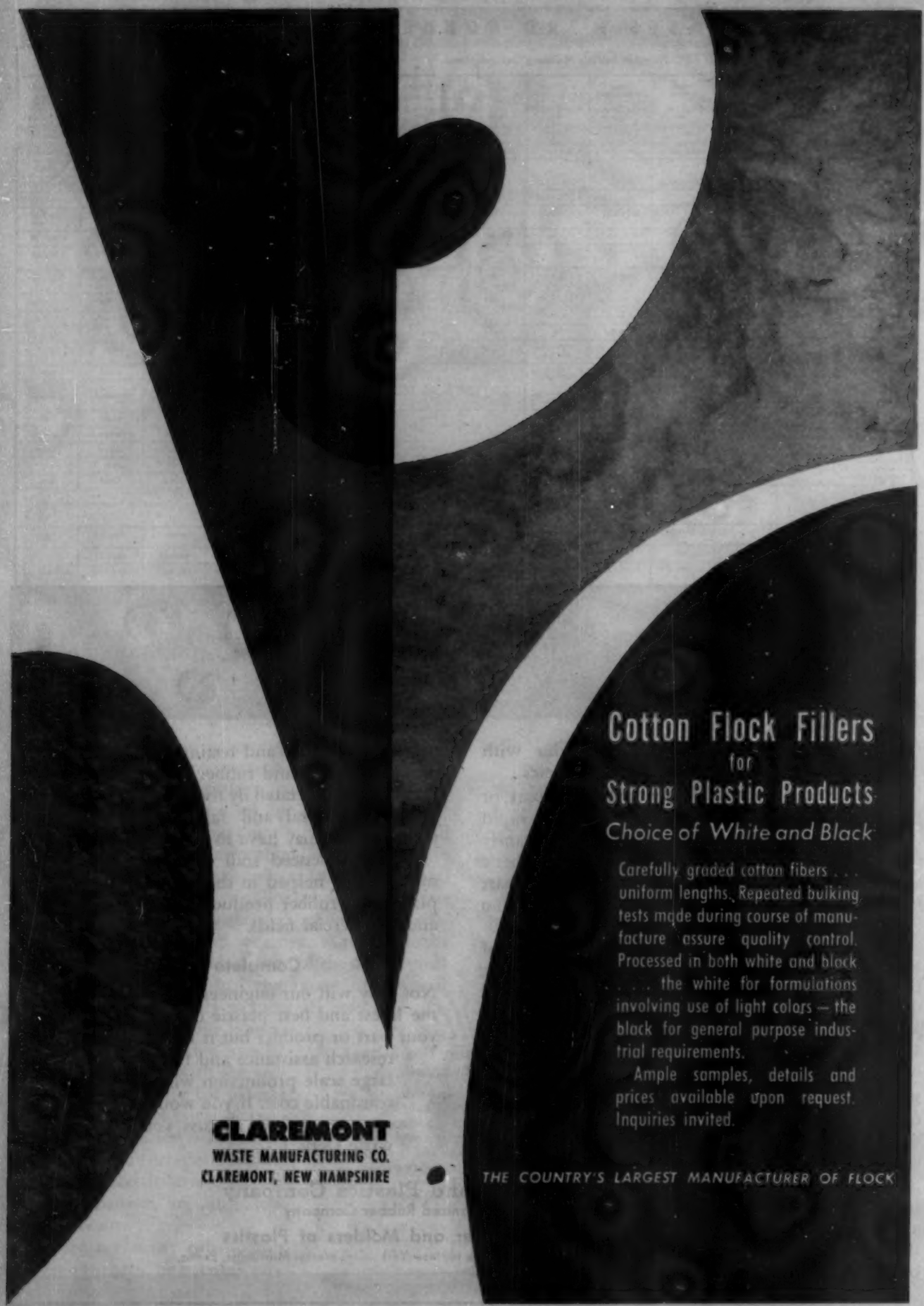
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The Problem of fungal growth*

In this article fungal growth is considered as it affects synthetic resins, plastics and plasticizers

by ALFRED E. BROWN†

A SEARCH of the scientific literature through 1944 reveals many references relating to the deterioration of textiles, leather, paints, metals and wood products by moisture and fungi, as well as treatments devised to protect these materials. But not one publication deals directly with the tropical deterioration of plastics or components thereof.[1] This paucity of information is by no means unexpected because, prior to the recent conflict, plastics were not giving any serious trouble of this nature in the temperate zones where they enjoyed their greatest use. However, in the past three years, the Armed Forces of the U. S. A. as well as those of Britain, Canada and Australia, moved large quantities of equipment into tropical areas.

The deterioration of textiles by microorganisms under tropical conditions is easily demonstrated and has been definitely accepted by all. As yet no such agreement exists in regard to many types of plastic materials. Because of the recent origin of this problem and because of the rather limited investigations that could be carried out during wartime, insufficient data have led to differences of opinions on fundamental questions.

For example, in some cases conclusive evidence that microorganisms grow on the plastic itself, rather than on surface contaminants like dust and fingermarks, has not as yet been obtained. This is due to the fact that no effective treatment for cleaning plastics without removing lubricants, etc., has been forthcoming and, as a result, most plastics are tested as received. Also, even though fungi do grow on nutrients supplied by some plastic materials, there is considerable doubt as to whether either the properties or the composition of the materials have actually been altered. An even more controversial question, especially with reference to the performance of plastics in electrical equipment, is whether fungi and moisture actually cause a greater deleterious effect on electrical properties of plastics than does moisture alone under the same conditions.

The Tropical Deterioration Administrative Committee of the National Defense Research Committee established in July 1944 a Subcommittee on Synthetic Resins, Plastics and Plasticizers under the chairmanship of Dr. Gordon M. Kline to consider the problems of tropical deterioration of these materials. When the Subcommittee began functioning shortly thereafter, meetings were held at which reports on investigations carried out by the Services, industrial laboratories and university projects were presented. The experimental evidence which was made available to the Subcommittee regarding the questions listed previously is reviewed in this report.

Fungal susceptibility of pure resins

The major component of almost all plastic materials is the polymer itself. For this reason a study of the fungal susceptibility of the resin without added plasticizer, lubricant and any other component is important. Table I lists the results obtained for representative materials by different laboratories.

A glance at the results shows why synthetic resins in general have earned the reputation of being resistant to fungus. The term *resistant* is used only to denote that the material does not serve as a source of carbon for the growth of fungi. Aside from the slight susceptibility of cellulose nitrate, polyvinyl acetate and melamine-formaldehyde polymers, synthetic resins are indeed resistant to fungal growth. However, although the resins themselves do not support fungal growth, it must be remembered that neither do they inhibit any such growth.

In view of the marked resistance of pure resins to fungal attack, it can be assumed that when plastic materials support growth, the addition of other components is most likely responsible for it. Such a hypothesis augers well for the future, since, as test results indicate which ingredients other than resins are

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* Abridged from Office of Scientific Research and Development Report No. 6067 (Oct. 1945) prepared for the Tropical Deterioration Administrative Committee. Details regarding the test methods used to determine fungal resistance and a recommended test procedure are given in the original report.

† Research associate, Subcommittee on Synthetic Resins, Plastics and Plasticizers of the Tropical Deterioration Administrative Committee, National Defense Research Committee. Present address: Milton Harris Associates, Washington, D. C.

[1] Two articles of a general nature have recently appeared. "Fungus and moisture protection," by R. Proskauer and H. E. Smith, Electronics *18*, 119–123 (1945), and "Fungus growths and electric apparatus," by A. C. Titus, General Electric Review *48*, 19–22 (Aug. 1945).

Table I.—Fungal Resistance of Pure Synthetic Resins[a]

Substance	*Extent of growth*[b]	*Laboratory*[c]
THERMOPLASTIC MATERIALS		
Cellulose acetate	B, A, A	1, 2, 5
Cellulose acetate butyrate	A, A	1, 5
Cellulose acetate propionate	A	1
Cellulose nitrate	C	1
Ethyl cellulose	A, A	1, 5
Polyethylene	A, A	1, 2
Polymethyl methacrylate	A, A, A	1, 2, 5
Polystyrene	A, A, A	1, 2, 5
Polydichlorostyrene	A	5
Polyvinyl acetate	C, A	1, 5
Polyvinyl butyral XYSG	A	3
Polyvinyl chloride	A, A	1, 2
Polyvinyl chloride-acetate VYNW	A, A	1, 3
Polyvinyl chloride-acetate VYNS	A	3
THERMOSETTING MATERIALS		
Phenol-aniline-formaldehyde	A, B	4, 5
Phenol-formaldehyde	A, B	3, 5
Melamine-formaldehyde	C, B	1, 5
Urea-formaldehyde	A, A	1, 2

[a] Where the same resin had been tested in different laboratories, all the results are given to indicate the divergence of opinion on ratings. These ratings are listed under *Extent of Growth* with the sources listed in the same order under *Laboratory*. Thus, for cellulose acetate, B, A, A under *Extent of Growth* followed by 1, 2, 5 under *Laboratory* means that the National Bureau of Standards (1) rated the material B, British Ministry of Supply (2) rated the material A, and the General Electric Co. (5) rated the material A.

[b] Code: A = no growth
B = very slight or light growth
C = moderate growth

[c] Code: 1 = National Bureau of Standards
2 = British Ministry of Supply
3 = Boyce Thompson Institute
4 = Naval Research Laboratory
5 = General Electric Co.

fungus-resistant, the addition of such components may give rise to fungus-resistant plastics.

Fungal attack on plastic components

Components other than the pure resin constitute an important portion of a plastic material. In laminated thermosetting materials the ply is usually a cellulose material like linen, canvas or paper, or an inorganic material like woven glass or asbestos. The susceptibility of the former, as well as the inertness of the latter, to fungal attack is well known. With molded thermosetting materials, the filler is usually a cellulosic material such as some type of woodflour, cut cotton cloth or an inorganic material like asbestos fiber or mica. Here again the behavior of these materials to fungal attack is well known. That all woodflours are not equally susceptible has recently been demonstrated by the Boyce Thompson Institute. Wood flock and walnut shell flour proved more susceptible than soft woodflour.

The situation with regard to thermoplastic materials is different. In these materials a whole variety of plasticizers is used. Many hundreds of compounds have been tried as plasticizers and some 150 materials which are presently in use are listed in the Plasticizers Chart of the PLASTICS CATALOG.[1] Since all organic materials cannot be utilized to the same extent as a source of carbon by all fungi, it is to be expected that

[1] 1945 PLASTICS CATALOG, New York. Plastics Catalogue Corp.

Table II.—Fungal Susceptibility of Various Plasticizers[a]

Plasticizer	*Extent of growth*[b]	*Laboratory*[c]
ABIETIC ACID DERIVATIVES		
Abietic acid	A	4
Hydrogenated methyl abietate	A, B	1, 4
ACONITIC ACID DERIVATIVES		
Tri-*n*-butyl aconitate	C, A	1, 4
Triethyl aconitate	B, A	1, 4
ADIPIC ACID DERIVATIVES		
Di-(1,3-dimethyl butyl) adipate	B	4
Di-(2-ethylhexyl) adipate	A	4
AZELAIC ACID DERIVATIVES		
Di-(ethylene glycol monobutyl ether) azelate	B	4
Di-(2-ethylhexyl) azelate	A	4
BENZOIC ACID DERIVATIVES		
Ethyl-o-benzoyl benzoate	A	1
Benzyl benzoate	C	1
CHLORINATED HYDROCARBONS		
Mixtures of chlorinated diphenyls		
Arochlor 1242	A	4
Arochlor 1248	A	4
Arochlor 1254	B	4
Arochlor 1262	A	4
Arochlor 1263	B	4
Arochlor 1270	A	4
Arochlor 5460	A	4
Chlorinated paraffins		
Chlorowax	A	4
Cerechlor	A	2
CITRIC ACID DERIVATIVES		
Tri-*n*-butyl citrate	A, A	1, 4
Triethyl citrate	A	1
GLYCEROL DERIVATIVES		
Glyceryl triacetate	C, C	1, 4
GLYCOL DERIVATIVES (*continued*)		
Diethylene glycol ethyl ether acetate	C, B	1, 4
Diethylene glycol butyl ether acetate	B	4
Diacetate of 2-nitro-2-methyl-1,3-propanediol	A	1
Dipropionate of 2-nitro-2-methyl-1,3-propanediol	A	1
Diethylene glycol dipropionate	A	1
Triethylene glycol di-(2-ethylhexoate)	A, A, A	1, 3, 4
Triethylene glycol di-(2-ethylbutyrate)	A, A, A	1, 3, 4
Polyethylene glycol 200	A	4
Polyethylene glycol 300	A	4
Polyethylene glycol 400	A	4
Polyethylene glycol 1500	A	4
Polyethylene glycol 6000	A	4
Polyethylene glycol di-(2-ethylhexoate)	A	1
GLYCOLIC ACID DERIVATIVES		
Ethyl phthalyl ethyl glycolate	C	1
Methyl phthalyl ethyl glycolate	B	1
Methyl phthalyl methyl glycolate	B	4
Butyl phthalyl butyl glycolate	C, C, A	1, 3, 4
LAURIC ACID DERIVATIVES		
Butyl laurate	D	4
Ethylene glycol laurate	D	4
Ethylene glycol ethyl ether laurate	D	4
Diethylene glycol monolaurate	D	4
Diethylene glycol ethyl ether laurate	D	4
Glyceryl laurate	D	4
Sorbitol laurate	D	4
OLEIC ACID DERIVATIVES		
Dibutyl ammonium oleate	D	4
Ethylene glycol methyl ether oleate	C	1

Table II.—Fungal Susceptibility of Various Plasticizers[a] (*Continued*)

Plasticizer	*Extent of growth*[b]	*Laboratory*[c]
OLEIC ACID DERIVATIVES (*continued*)		
Nitrile from oleic and linoleic acids (NTD-181.5-B)	D	3
Sorbitol oleate	D	4
PENTAERYTHRITOL DERIVATIVES		
Dipentaerythritol hexaacetate	A	1
Dipentaerythritol hexapropionate	B	1
Dipentaerythritol hexabutyrate	A	1
Pentaerythritol diacetate dibutyrate	C	1
Pentaerythritol diacetate dipropionate	C	1
Pentaerythritol monoacetate tripropionate	B	1
Pentaerythritol triacetate monopropionate	C	1
Pentaerythritol tripropionate monomyristate	C	1
Pentaerythritol tetrabutyrate	C	1
Pentaerythritol tetrapropionate	C	1
PHOSPHORIC ACID DERIVATIVES		
Triethyl phosphate	A	1
Tributyl phosphate	A, A	1, 4
Tri-(2-ethylhexyl) phosphate	A	3
Triphenyl phosphate	A	1
Tributoxyethyl phosphate	A	4
Tricresyl phosphate	A, A, A, A	1, 2, 3, 4
Tri-(2-nitro-2-methylpropyl) phosphate	A	1
Diphenyl mono-(*p*-tert.-butylphenyl) phosphate	B	4
Monophenyl di-(*p*-tert.-butylphenyl) phosphate	A	1
Diphenyl mono-(*o*-chlorophenyl) phosphate	A	4
Diphenyl mono-*o*-xenyl phosphate	A, B	1, 4
Di-*o*-xenyl monophenyl phosphate	A, A	1, 4
Tri-(*p*-tert.-butylphenyl) phosphate	A, A	1, 3
Tri-(*o*-chlorophenyl) phosphate	A	4
Tri-(*o*-xenyl) phosphate	A	1
PHTHALIC ACID DERIVATIVES		
Dimethyl phthalate	A	1
Diethyl phthalate	A, A	1, 4
Di-*n*-propyl phthalate	A	1
Di-isopropyl phthalate	A	1
Dibutyl phthalate	A, A, A	1, 2, 4
Di-isobutyl phthalate	A	1
Diamyl phthalate	C	1
Dihexyl phthalate	A	2
Dicapryl phthalate	A, B	1, 4
Dioctyl phthalate	A	1
Di-(2-ethylhexyl) phthalate	A, A, A	1, 3, 4
Dicyclohexyl phthalate	A	1
Dibenzyl phthalate	A, B	1, 4
Diphenyl phthalate	B	4
Dimethoxy ethyl phthalate	A	1
Diethoxy ethyl phthalate	A	1
Dibutoxy ethyl phthalate	A, A	1, 3
Methyl-2-methyl-2-nitropropyl phthalate	A	1
Ethyl-2-methyl-2-nitropropyl phthalate	B	1
Butyl-2-methyl-2-nitropropyl phthalate	A	1
Bis-(diethylene glycol ethyl ether) phthalate	A	1
RESIN PLASTICIZERS		
Glycol sebacate resin	D	1
Sebacic acid alkyd resins		
Paraplex G-25	D, C	1, 3
Paraplex RG-2	D	1
Paraplex RG-20	D	1
Paraplex X-100	D	3
Ester type alkyd resin (Duraplex C50LV)	D	4
Silicone oil (Fluid #500)	A	4
RICINOLEIC ACID DERIVATIVES		
Methyl acetyl ricinoleate	D	3
Butyl acetyl ricinoleate	D	1
Ethylene glycol methyl ether acetyl ricinoleate	C	1
Glyceryl monoricinoleate	D	4
SEBACIC ACID DERIVATIVES		
Dimethyl sebacate	C	1
Dibutyl sebacate	C, C	1, 4
Di-(1,3-dimethyl butyl) sebacate	B	4
Di-(2-ethylhexyl) sebacate	C	4
STEARIC ACID DERIVATIVES		
Stearic acid	D	3
n-Butyl stearate	C	1
Cyclohexyl stearate	D	1
Butoxy ethyl stearate	D, D	1, 4
Diethyl glycol ethyl ether stearate	D	4
Tetraethylene glycol monostearate	D	4
Tetraethylene glycol distearate	D	4
SUCCINIC ACID DERIVATIVES		
Diethyl succinate	A	4
SYNTHETIC FATTY ACID DERIVATIVE		
Fatty acid dimethyl amide (Plasticizer 35)	D	4
TARTARIC ACID DERIVATIVE		
Di-*n*-butyl tartrate	A	1
TOLUENESULFONIC ACID DERIVATIVES		
Ethyl-*p*-toluenesulfonate	A	1
o-Cresyl-*p*-toluenesulfonate	A	1
o- and *p*-Toluene ethylsulfonamide	A	1
TRICARBALLYLIC ACID DERIVATIVES		
Triethyl tricarballylate	B	1
Tri-*n*-butyl tricarballylate	B	1
OILS—NATURAL AND SYNTHETIC		
Tung oil	B	4
Castor oil	D, D, D	1, 3, 4
Cottonseed oil	D	4
Dehydrated castor oil	D	3
Refined tall oil (Indusoil)	D	3
Sulfonated oil (Naftolen R-510)	A	4
Coal tar oil	A	4
Petroleum oil	A	4
MISCELLANEOUS MATERIALS		
Diphenyl	A	1
Diamylnaphthalene	A, A	1, 4
Diamylphenoxyethanol	A	4
Benzophenone	A	4
Methylamyldihexylcyclohexanone	A	4
Cyclohexyl lactate	A	1
Methylcyclohexyl oxalate	A	1
Diphenylsulphone	A	1
Triphenylguanidine	A	1
Triethanolamine dicaprylate	D	4

[a] Where the same plasticizer has been tested in different laboratories, all the results obtained are listed under *Extent of Growth* with the sources listed in the same order under *Laboratory*.

[b] Code: A = no growth
B = very slight or light growth
C = moderate growth
D = heavy and very heavy growth

[c] Code: 1 = National Bureau of Standards
2 = British Ministry of Supply
3 = Boyce Thompson Institute
4 = Naval Research Laboratory

some plasticizers will be more resistant than others.

The data obtained for the susceptibility of plasticizers to fungal attack are presented in Table II. The compounds are listed in the same order as found in the Plasticizers Chart. Three general classes—Oils, Resin plasticizers and Miscellaneous—have been added.

These data can be used as a guide in the selection of resistant materials for plastic formulations. In many cases, where a number of plasticizers can serve equally in imparting the required properties, one that is rated *A* or *B* would be preferred if greater fungal resistance is desired in the plastic. Including a plasticizer rated *D* in a formulation would render a plastic susceptible to attack. It is for this first purpose that all the specific plasticizers have been listed so that this information may receive the widest circulation.

In the pharmaceutical and nutritional fields, the relationship between physiological activity and chemical structure receives a good deal of study. In this manner, the importance of certain functional groups is discovered, and tailor-made molecules are synthesized for special purposes. The success of this method in the sulfa drug field is well known. Since the nutritional availability of various substrates to fungi is also a physiological function dependent probably on enzyme systems, in spite of the numerous genera of fungi involved, a correlation with structure should be apparent from a study of a sufficient number of compounds.

Study of the data with this latter purpose in mind leads to a number of conclusions. The striking susceptibility of fatty acid derivatives is easily discerned. Thus, all derivatives of lauric, oleic, ricinoleic and stearic acids are attacked. In addition, natural oils like castor and cottonseed containing glyceryl esters of these acids are susceptible.

A sufficient number of aliphatic dicarboxylic acid derivatives have not as yet been tested, but the data available show that whereas succinic and adipic acid derivatives are resistant, the sebacic acid derivatives are susceptible. Thus, in this series also, a long carbon chain of 10 atoms or more renders the derivative susceptible. The three aliphatic tricarboxylic acid derivatives listed, those of citric, aconitic and tricarballylic acids, are seen to be resistant.

As long as the glycol and glycolic acid derivatives do not contain any aliphatic acids having chains of 10 or more carbon atoms, the results show them to be resistant to fungal attack. Pentaerythritol esters are found to be fair to good in resistance.

The results obtained with the phthalic acid derivatives, many of which enjoy wide use, are consistent and conclusively show that these derivatives are very resistant to fungal attack. Thus, the aliphatic esters ranging from dimethyl to dioctyl phthalate, and including the ester of the cyclic alcohol, cyclohexanol, as well as the Cellosolve and Carbitol esters are all resistant. The phenyl and benzyl esters are also resistant. The phosphoric acid derivatives show a similar behavior. All the aliphatic and aromatic esters listed are resistant to fungal attack.

The resistance of the toluenesulfonic acid derivatives, as well as the resistance of the aromatic hydrocarbons, is also obvious. The only terpene derivatives investigated, those of abietic acid, were also found resistant.

Although the choice of both a resistant resin and a resistant plasticizer in a plastic are indicated, on the basis of present knowledge, it cannot be said that because components *A* and *B* are resistant, the combination of *A* and *B* is resistant. Experiments show that combinations of dioctyl phthalate with vinyl resins are more susceptible than either alone. However, the presence of small quantities of lubricant must be considered for it has been shown that the plasticizer-lubricant combination is more susceptible than either one alone.

Further investigation on mixtures of components such as resins, lubricants and plasticizers should cast more light on these problems. However, it is generally acknowledged at the present time that the fungal resistance of a plastic can be estimated with some certainty if the susceptibility of the components which go to make it up are known. It is for this reason that data on plastics components are so valuable.

Susceptibility of plastic compositions

Included in the vast array of items termed *military matériel*, one finds many examples of plastics. Thus, items as varied as molded gun stocks, gun covers, aircraft windows, terminal boards in radio sets, machete sheaths, helmets and belly tanks may be included. The resins on which these materials are based may indeed be similar, but the complete compositions of the final articles are often different. In this sense terminal boards are not merely phenol-formaldehyde resins, nor are gun covers merely polyvinyl chloride-acetate resins. The terminal board ordinarily contains plies of fabric or paper if it has been prepared from laminated stock, or it has filler added if it is a molded piece. In the same manner the vinyl esters have added plasticizers, lubricants and stabilizers.

If it is constantly kept in mind that commercial plastics as we know them are complex mixtures, the conflicting reports concerning tropical deterioration of certain plastics become more understandable. A polyvinyl chloride-acetate insulation covering is not the same material as a polyvinyl chloride-acetate coating on a raincoat, nor is a phenolic gun handle the same material as a phenolic tube socket.

Being aware of the fact that a plastic is a mixture of components, one might think that the first step would be to check all the components of plastics for fungal susceptibility and then make the plastics from resistant components. This approach is sound, and has great merit. However, when plastic materials performed unsatisfactorily in the Southwest Pacific areas, there was no time to await results from such a long range program. Instead many commercial materials were tested as is, and this section includes a summary of the results obtained.

In the usual case, the results reported were obtained

on plastic samples that were neither sterilized nor cleaned in any special way. In regard to the matter of sterilization of plastics to prevent growth of contaminating organisms on the piece, there has been no demonstration as yet of a method that will do this without altering the material. Ultraviolet exposure for a short period of time has been recommended but as yet not tried.

The effects of volatile fungicides on plastics have not been studied, although such treatments with methanolic vapor and chloropicrin have been suggested. With volatile fungicides, one has the disadvantage of eliminating identical control conditions unless the sample under test is similarly treated. Wet and dry heat sterilization is thought to be more deleterious in effect than the other agents mentioned. Ozone treatment brings up the possibility of chemical change. However, the fact that most of the above discussion on treatments for sterilization of plastics covers opinions, rather than facts based on experimental evidence, is indicative of the work that remains to be done on this problem.

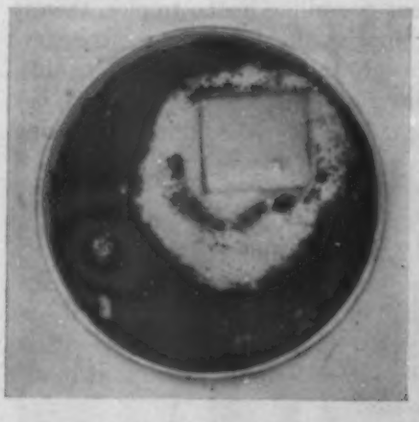
On the basis of results reported by the Sperry Gyroscope Co., Bakelite Corp., Materials Laboratory of the New York Navy Yard, Signal Corps Laboratory at Fort Monmouth, M.I.T. Radiation Laboratory and the British Ministry of Supply, certain conclusions may be drawn. With the laminated materials, although the phenol-formaldehyde, urea-formaldehyde and melamine-formaldehyde resins are inert, paper and cloth render the materials easily susceptible to fungal growth at cut edges. Of course, if the resin surface is broken in any manner and the cloth exposed, fungus will grow there also. It is with this type of material that the use of suitable varnishes on cut edges has been suggested. Laminated materials that contain glass cloth, mat or asbestos cloth are quite resistant to fungal attack provided that no susceptible sizing material like starch is on the cloth.

The resistance of molded pieces to fungal attack is much better than that of laminated materials. Where cut cotton rag has been incorporated, susceptibility is great. However, woodflour-filled phenolics are not too susceptible to fungal attack, although in time they support a slight surface growth. The quality of the molded piece is very important in this case. Since molded pieces have no rough or cut edges, their increased resistance might be expected. Phenolics filled with glass, mica and asbestos are very resistant to fungal attack. Molded plastics containing melamine-formaldehyde resins have perhaps a slight advantage over phenolic molding materials.

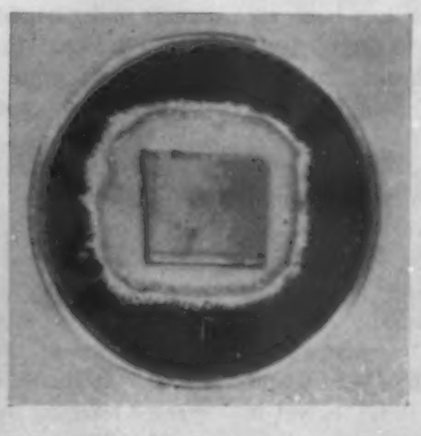
If resistant plasticizers as well as no excessive amount of susceptible lubricants are used, thermoplastics are quite resistant. Thus, polystyrene, polymethyl methacrylate, polyethylene and nylon plastics, in which little or no plasticizers are used, are resistant to fungus. On the other hand, cellulose acetate as well as mixed esters of cellulose, ethyl cellulose and polyvinyl materials in which large amounts of varied plasticizers are used pose a different problem. With these materials fungal resistance will vary from poor to excellent, dependent on the nature of the components in the plastic other than the resin. If proper precaution is taken to include only resistant components wherever feasible, the behavior of these materials under tropical conditions should be more satisfactory.

Effect of fungus on plastics properties

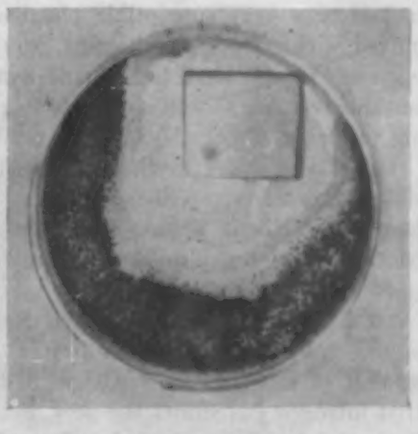
Since some properties of plastics are markedly influenced by moisture alone, it is in an attempt to observe changes in properties under conditions of fungal growth that the relative roles of moisture and fungus become interwoven. Especially in electrical equip-



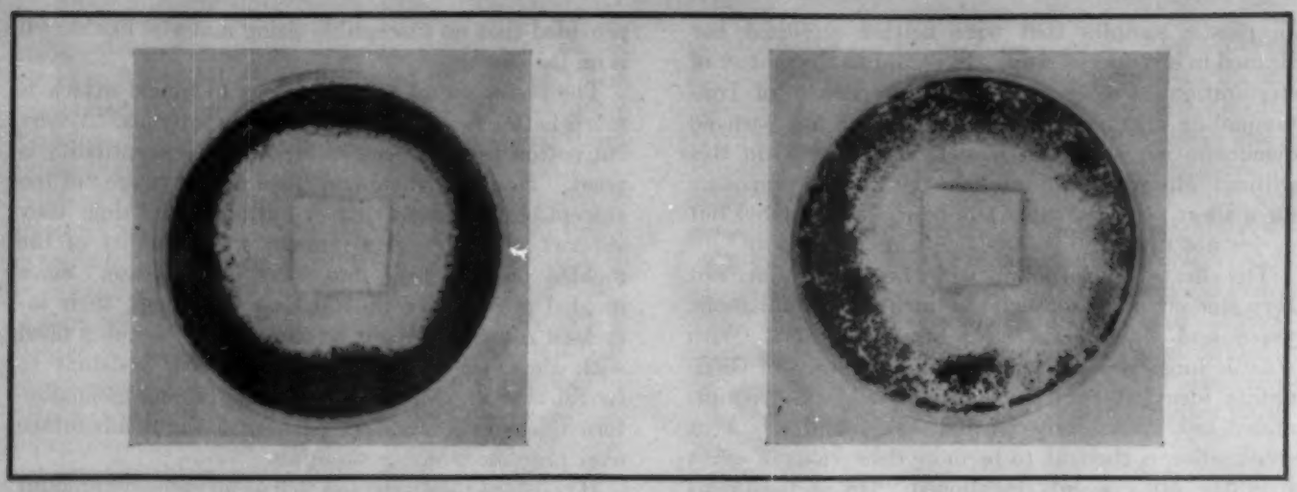
In this test specimen, vehicle is ethyl cellulose and tricresyl phosphate. Toxant: none. Toxant concentration: none. Organism: A. convolutus, A. niger, P. luteum, R. nigricans. Period of incubation: 5 days. Area of inhibition: growth over edge. Rating: poor



Here the vehicle is ethyl cellulose and tricresyl phosphate. Toxicant: phenyl mercurial A. Toxicant concentration: 0.5 percent. Organism: A. convolutus, A. niger, P. luteum, R. nigricans. Incubation period: 5 days. Inhibition area: ¼ to ½ in. Rating: good



This test specimen's vehicle is ethyl cellulose and tricresyl phosphate. Toxicant: phenyl mercurial A. Toxicant concentration: 1 percent. Organism: A. niger, A. convolutus, P. luteum, R. nigricans. Incubation period: 5 days. Inhibition area: ¼ to ¾ inch. Rating: good



The vehicle for this test specimen is glass laminate and an unsaturated polyester. Toxicant: phenyl mercurial B. Toxicant concentration: 0.5 percent. Organism: aspergillus niger. The period of incubation: 5 days. The area of inhibition: ¼ inch. The rating: good

Here the test specimen's vehicle is glass laminate and an unsaturated polyester. Toxicant: phenyl mercurial B. Toxicant concentration: 0.5 percent. Organism: A. niger, P. luteum, R. nigricans, A. convolutus. Incubation period: 5 days. Inhibition area: ¼ inch. Rating: good

ment, the change in properties introduced by moisture and fungus is detrimental to the performance of the equipment. The simple fact that fungi grow on the plastic is proof that the relative humidity of the surrounding atmosphere is at least 70 to 80 percent, and probably considerably higher. In addition, any type of mold growth, however slight in quantity, acts as an agent for the condensation and entrenchment of further moisture. Thus, there may be an effect of fungus in addition to the effect of moisture on the properties of the plastic.

In regard to the question of permanent alteration of properties of plastics due to fungal growth, aside from a very few cases where a cellulose filler has been attacked or a very susceptible plasticizer has been removed with resulting brittleness, no data demonstrating such attack have been made available. Lack of suitable control, as well as lack of work along this line, are probably responsible.

It has been the experience of many that it is not possible to keep an unsterilized plastic sample under high humidity without having fungal growth due to the contaminating organisms on the sample. The question of sterilization of the sample to avert such growth for control purposes has already been discussed. Another approach has been the use of an inert atmosphere such as that of nitrogen gas. Although it has been found that nitrogen gas stunts the growth of fungi, as yet it has not been demonstrated that such an atmosphere would completely inhibit growth of fungi. There is a great deal of experimental work now being done on the question of obtaining a good control.

Addition of fungicides to plastics

Even though some plastic materials are fungus-resistant, they are not fungistatic. Thus, debris and external contaminants on the material can serve as a source of fungal growth. During the war period attempts were made to render susceptible plastics fungistatic by the use of fungicidal coatings. In an approach to the problem from another angle, fungicides were incorporated directly into plastics during their manufacture in an attempt to insure some degree of fungal resistance of the material without any subsequent treatment.

In all discussions about fungicides for plastics, it must be remembered that in many cases there may be no need for fungistatic plastics. When it has been definitely established that plastics made from the most resistant components are still unsatisfactory for certain uses under conditions prevailing in the tropics, then it may be true that fungistatic plastics are necessary. However, even though the need is still debatable, preliminary experimental work on this problem has been under way to explore the possibilities of making fungistatic plastics so that they would be ready if needed.

In order for a fungicide to be effective in plastics, it should conform with the following requirements:

1. The compound should be compatible with the resin.
2. The compound should have a low volatility so that it would not be lost during the molding operation.
3. It should be sufficiently insoluble so that it will resist leaching by water.
4. The presence of the fungicide should have no significant effect on the physical properties of the plastic.
5. The fungicide should be chemically inert so that it is not altered by reaction with other components of the plastic mass with a corresponding loss in fungicidal activity.
6. Incorporation of the compound should not neces-

sitate a drastic change in manufacture.

7. The compound should be effective for a sufficient length of time, preferably the service life of the material.

8. The compound should be non-toxic to the worker handling the material, or at least be relatively non-hazardous.

9. The final product should offer no health hazard, such as a skin irritant on continued use by personnel.

At present it seems almost impossible to fulfill some of these requirements. For example, in order for the surface of the plastic to be fungistatic, an effective concentration of fungicide must always be present there. Presumably this requirement implies a constant loss of fungicide, the rate of which is dependent on its volatility as well as external conditions. From this it is evident that a fungicide should be effective in low concentration if the fungistatic property of the plastic is to have any appreciable life period.

Preliminary work indicated that it was impossible to predict whether a given fungicide would function effectively in a given plastic system. Therefore, experimentation in this field was necessarily of an empirical nature. In one investigation[3] phenolic plastics were prepared with fungicides incorporated directly in the material. All the materials prepared were sent to three different laboratories for test. In most cases the fungicide was used in concentrations of 0.25, 0.5, 0.75, 1.0, 1.5 and 2.0 percent. In addition to the testing of the treated plastics, control samples of untreated plastics were included. In the compounding of molding resins the dry fungicide was added to the premix. Where fillers were included, two methods of treating the filler were used. In one case the paper or cloth was impregnated by immersion in a solution of the fungicide, and in the other case the fungicide was incorporated into the resin used to coat the filler.

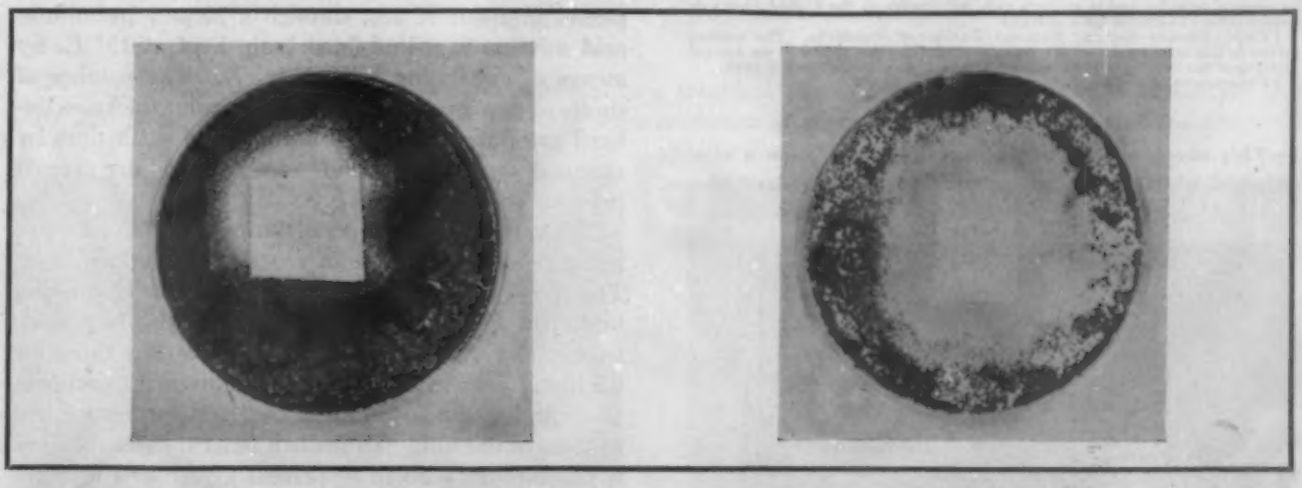
On the basis of fungal resistance alone, the incorporation of salicylanilide was found to yield the best protected plastics. The compound is safe to handle, is compatible with the resins, has a vapor pressure low enough to prevent excessive losses during processing, and has a marked effect on the inhibition of fungal growth. Copper naphthenate was too disagreeable to work with, as well as fairly incompatible with the resins. The organic mercurials were a health hazard, and the chlorinated phenols were too volatile.

Subsequently, the same investigators determined the effects of the incorporation of salicylanilide on the physical properties of the plastics. Tests were conducted on molded and laminated phenolic compounds having 2 percent of salicylanilide incorporated during the process of manufacture. The laminated phenolics so prepared comprised two fabric base grades and three paper base grades, the untreated controls meeting the requirements of JAN-P-13 specification for grades EM-1 (FBG), EM-2 (FBE), E-5, E-4 (PBE) and M-1 (PBM). The molded phenolics made were those of which the untreated standard counterparts meet the requirements of JAN-P-14 specification for grades E-1 (CFG), M-3 (CFI-10), E-4 (MFE) and one grade of melamine-resin asbestos-cellulose compound. The materials were tested according to the JAN specification tests, and from an examination of the test data it was concluded that the addition of salicylanilide in 2 percent concentration had little or no effect on the physical properties of the molded or laminated materials studied.

Experimental work on fungistatic plastics has also been carried out at the Boyce Thompson Institute.[4] Here, too, disappointing results were obtained with phenolic cloth laminates. The cloth was impregnated with 2 percent of the fungicide, and then made into laminates with a phenolic resin. The following fungicides were tried: (*Please turn to page 254*)

[3] L. V. Larsen and W. Goss, General Electric Co.

[4] R. H. Wellman and S. E. A. McCallan, Boyce Thompson Institute. Project sponsored by the Bakelite Corp. under contract with the Office of Scientific Research and Development and supervised by the Tropical Deterioration Administrative Committee.



In this test specimen, vehicle is glass laminate and an unsaturated polyester. The organism: aspergillus niger. Period of incubation: 5 days. Area of inhibition: slight growth on specimen. Rating: poor

This test specimen has the same vehicle, glass laminate and an unsaturated polyester. Organism: A. niger, P. luteum, R. nigricans, A. convolutus. Period of incubation: 5 days. Area of inhibition: none. Rating: bad

Manufacture of vulcanized fibre in Germany*

by G. M. KLINE† and R. RICHARDSON‡

VULCANIZED fibre is a cellulose product made by gelatinizing paper and welding many layers together into a relatively homogeneous material. The paper is ordinarily prepared with cotton rags, but because of a scarcity of these rags in Germany during the war, sulfite paper of high alpha cellulose content was used. Dynamit A.-G. at Troisdorf is the leading producer of vulcanized fibre in Germany and its product, sold in the form of sheets, rods, tubes and shapes of all kinds, and in rolls as leatheroid, is known by the trade name Dynos. Two processes are employed in its manufacture; one involves gelatinization of the cellulose in a zinc chloride solution and the other process (which is used for thin sheet stock) involves gelatinization in sulfuric acid.

Zinc chloride process

The paper (60 to 90 g./m.²) is passed at a rate of 9 meters per min. through a 70 percent zinc chloride bath at 60° C. (Fig. 1). One kilogram of cellulose takes up 2.5 kg. of solution. The paper is wound as a tube on a roll that is heated to 40° C. with another roll at 90° C. pressing against it. When the desired thickness is attained, the tube is slit. It is then possible for the impregnated paper to be removed in the form of a flat sheet.

The zinc chloride is removed by a leaching process in several baths of diminishing zinc chloride concentration and finally in water. The sheets are first placed in a 50 percent zinc chloride solution bath (Fig. 2). When the concentration of the bath reaches 60 percent, the solution is removed and a 30 percent solution run in. This process is continued until the zinc chloride content has been reduced to 0.06 percent by immersion in water. This takes 3 weeks for a 2-mm. thick sheet, 1 year for a 40 mm. thickness. The material is then brought to a mechanical washing machine (Fig. 3) where the dirt is removed by the scrubbing action of brushes.

The thin sheets are then dried by passage through an oven (Figs. 4 and 5) heated with circulating air (2 to 6 cu. meters per sec.) at 140 to 200° C. Drying time is 25 min. for 1-mm. thick sheets, 45 to 50 min. for 20 mm. thickness. The moisture content is reduced to 6 to 8 percent. The sheets are then flattened in hydraulic presses (Fig. 6).

Sulfuric acid process

A roll process is used for making vulcanized fibre sheets of 0.1 to 0.5 mm. thickness. The paper is passed in about 10 sec. through a 70 percent sulfuric acid solution in a lead-lined bath, kept at 15° C. by means of circulating brine (Fig. 7). The number of sheets of paper required for the particular thickness desired are put through the bath at the same time by means of separate feed and guide rolls and are pressed between rolls to form the sheet.

The material is then passed through six cooled water baths (Fig. 8) to leach out most of the sulfuric acid. The roll is then transferred to another set of washing tanks through which the vulcanized fibre is passed, two times for 0.1 mm. thickness and twenty times for 0.5 mm. thickness. It is finally treated with ammonia to neutralize the last trace of acid and further washed to remove the salt. To make a flexible sheet the fibre is put through a 20 to 30 percent glycerol bath to get a glycerol concentration in the sheet of 20 percent. The sheets are dried by passage over rolls (Fig. 9) heated to 90 to 110° C.; this requires 12 min. for sheets of 0.5 mm. thickness.

* Developments in the German plastics industry during the war have been thoroughly investigated by teams composed of technical representatives of the Ordnance Department, Quartermaster Corps, Chemical Warfare Service, Technical Industrial Intelligence Committee and other groups. The Department of Commerce is merely distributing this technical information which has come into its hands from captured German territory. This information should be made available to all United States citizens interested in it, but use of it by anyone must be and is at one's own risk insofar as the United States or foreign patent violations are concerned.

† Chief, Plastics Section, National Bureau of Standards. The subject matter in this article was part of a paper presented by this author at the Annual Meeting of the Society of Plastics Engineers in Detroit on January 8, 1946.

‡ Department of Reconstruction, Dominion of Canada.

1—This machine is used for treating paper with a zinc chloride solution in the manufacturing of vulcanized fibre

2—Washing tanks used to remove the zinc chloride solution from the sheets of paper

Approximately 260 tons/mo. of vulcanized fibre was produced during the war, of which 15 to 20 tons/mo. was made by the sulfuric acid process. It was made in thicknesses up to 45 mm.; the thickest sheets were used in the electrical and textile industries. An important use was the fabrication of gasoline tanks for aircraft from 2 mm. thick sheets which were formed and then cemented together with urea-formaldehyde resinous adhesive. Eighty tons/mo. was used for this purpose.

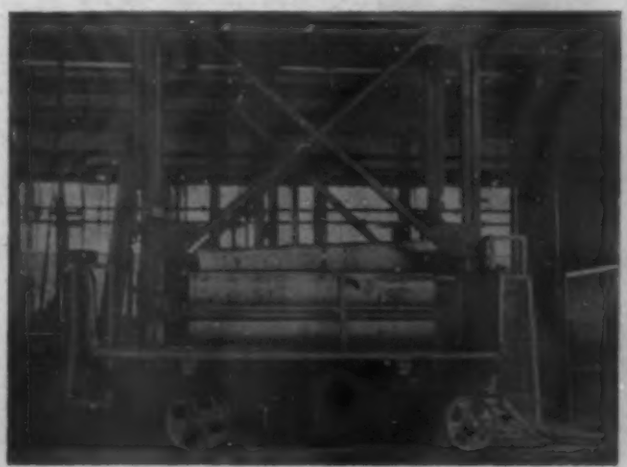
Vulcanized fibre is used in the machine, metal, armature and automotive industries in shaft bearings, brake linings, containers for brushes, packing rings and washers for water and compressed gas, thrust collars and friction rings. It is used for disks, tool handles, knobs for typewriters and radiators, cable guides, piston rings, bearings, bearing bushings, ring bearings, rollers, collars, knife handles, lids for pumps, carrier tubes for pneumatic communication systems, storage battery parts, nozzles for vacuum cleaners, wheels and gears. The latter have the advantages of noiseless motion and insensitivity to water-free oils and fats.

In the textile industry, vulcanized fibre is used for brake rings, harness boards, covers for printing rollers, thread guides and rolls, card covers, pickers, picker buffers, dobby cards, picking stick buffers, reeds, sliver cans, spinning rings, spool flanges and heads, boxes and carriages, shuttle fittings and small gears for narrow built band looms.

As an insulating material in the electrical industry vulcanized fibre finds application as induction nozzles, veneers for switchboards and telephone tables, insulating boards, terminal inserts, controller rolls, housing for fluorescent lamps, key depressors, switch knobs and handles, insulating layers for rails, sliding contacts, plates for wall plugs, lock-nuts and plug handles.

Miscellaneous uses include sheets, corners and frames for the luggage industry, boxes for filing cards, lacquered fibre for visors, coasters for furniture, waste-paper baskets and megaphones. (*Please turn to next page*)

3—Superficial dirt is removed from the material by a scrubber. 4—An oven for drying vulcanised fibre is seen from the entering end. Dr. Kurt Nising, superintendent of the plant, and Dr. Kline are at the left



5—View of the vulcanized fibre leaving the drier

6—A hydraulic press used for flattening dried fibre

Properties

The natural color of vulcanized fibre is from light to dark gray. In order to produce colored fibre, the raw paper stock is dyed. Table I presents information regarding various properties of vulcanized fibre.

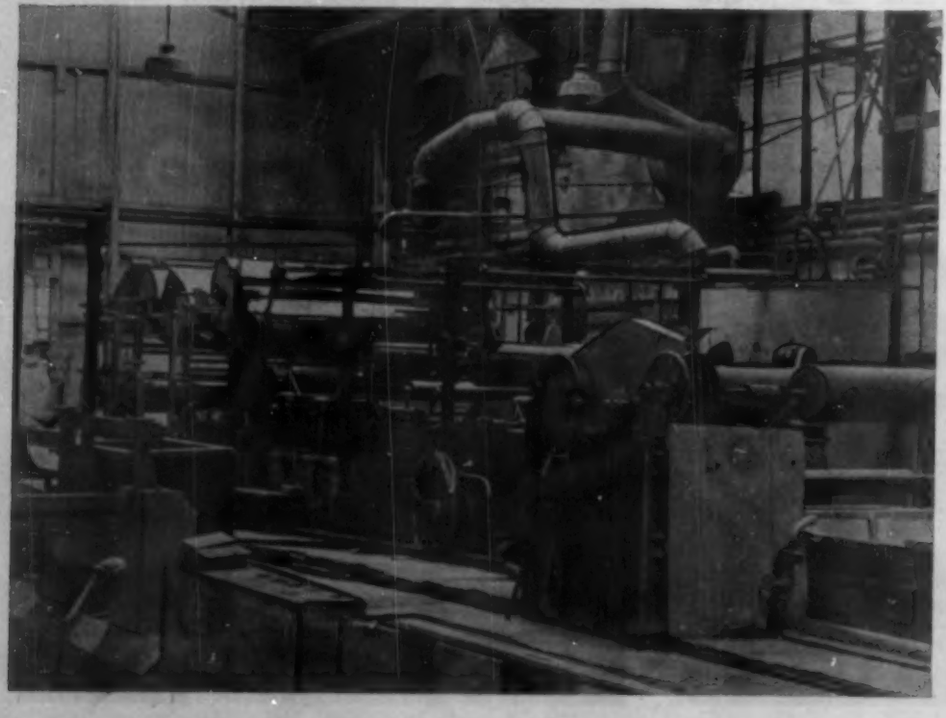
Vulcanized fibre can be cut (up to a thickness of 2 mm.), sawed, planed, milled, filed, stamped out, punched, drilled, shaped on a lathe, threaded, bent, riveted, glued, stretched, abraded and polished.

The following precautions should be observed: Use sharp instruments and grind them regularly; work as vertically as possible to the layers. Don't use too high rotation speed. Feed fast. Bend with the fibre direction, i.e., parallel to the width of the sheets or rolls. Avoid bends and folds exceeding the width of the sheets and rolls. If high mechanical strength is required, material of high density should be used. On the other hand, material of low specific gravity is better suited for stamped-out parts.

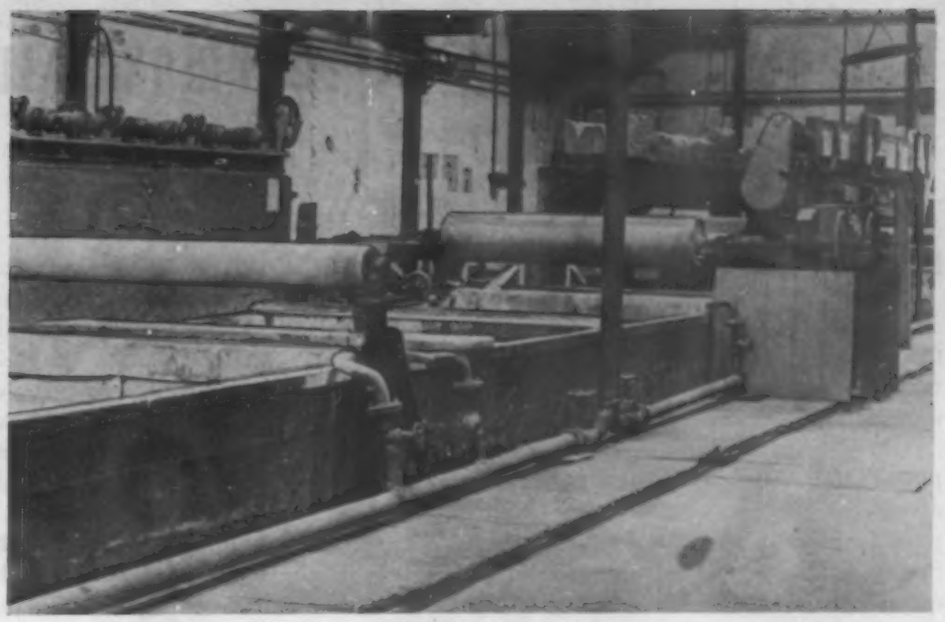
Vulcanized fibre is a layer material. In sheets the layers run in the same direction as the surface of the sheet. In tubes the layers run circularly around the axis of the pipe. In rods, always made from sheets, the fibre direction is the long direction of the rod. Therefore rods cannot be made into thin-walled pipes, rings, gears, thin-walled bushings, etc. These parts should always be made from sheets so that the layers of the vulcanized fibre will be perpendicular to the axis of the part. However, rods are suitable for insulating handles, stoppers, buttons and the like.

Godynin

This is a composite material made from sheets of aluminum alloy and vulcanized fibre. It is only in an experimental development stage. The fact that the



7—The machine for gelatinising the paper with sulfuric acid, showing the three rolls feeding the paper sheets simultaneously into the acid bath



8—The continuation of the machine shown in Fig. 7. The fibre is rolled up at the end of this machine and then run through a washing tank (at left)

coefficients of linear thermal expansion of the two materials are nearly equal is said to be an important factor in the stability of the composite material. Because of its lightness, toughness and ease of fabrication, Godynin is said to be useful for airplane construction and to be an improvement over plywood in cases where bullet and shock resistance are required.

The fibre is cut into sheets 2 by 1 meters and sand-blasted to prepare the surface for gluing. The light metal sheet is bonderized in an acid bath. The vulcanized fibre and aluminum sheets are given a priming coat of Pergut (chlorinated rubber) and then several coats of Perbunan (butadiene-acrylonitrile copolymer) solution until a solid coating of 125 g./m.^{2} has been applied. After a 24-hr. drying period to get rid of the benzene solvent, the two materials are pressed together for 1 to 1.5 hr. at 130° C. and 30 kg./cm.^{2} pressure. The composite sheets are cooled before removal.

For the preparation of 1 sq. meter of Godynin in 1.5 mm. thickness the following materials are required:

Vulcanized fibre	1.10 kg. (1 mm. thick)
Aluminum sheet	0.85 kg. (0.3 mm. thick)
Pergut	0.17 kg.
Perbunan	0.45 kg.
Benzene	0.85 kg.

It was estimated that the monthly production for 25 working days and 3 shifts for a 12-stage press would be 3200 sq. meters of Godynin, equivalent to 1600 sheets 1 by 2 meters.

Table I.—Properties of Vulcanized Fibre[a]

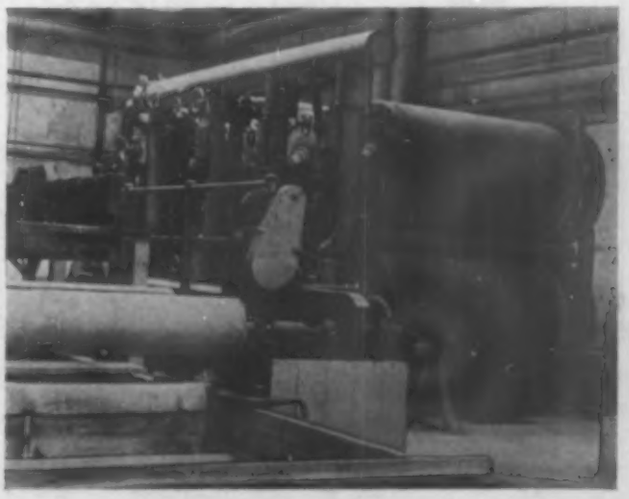
Specific gravity	1.1–1.45
Tensile strength:	
Lengthwise, kg./cm.^{2}	800–1200
Crosswise, kg./cm.^{2}	500–800
Compressive strength:	
Perpendicular to surface, kg./cm.^{2}	ca. 3000
Flexural strength, kg./cm.^{2}	800–1300
Impact strength:	
Unnotched, cm.-kg./cm.^{2}	120–190
Notched, cm.-kg./cm.^{2}	17
Brinell hardness, kg./cm.^{2}	800–1400
Dielectric strength, minimum:	
Up to 5 mm., volt/mm.	3000
5–10 mm., volt/mm.	2000
Over 10 mm., volt/mm.	1000
Insulation resistance, internal, minimum:	
Up to 4 mm., megohm	1000
Over 4 mm., megohm	500
Tubes, megohm	500
Resistance to gases	Impermeable
Resistance to oils, benzene, benzine, alcohols and other organic solvents	Stable
Flammability	Slight
Heat stability (Martens), ° C.	70–90

[a] The tests were made in accordance with German standard methods described in "Vorschriftenbuch des Verbandes Deutscher Elektrotechniker." The values can be converted to units used by the A.S.T.M. by using the following factors:

kg./cm.^{2} to lb./in.^{2} 14.2
cm.-kg./cm.^{2} to ft.-lb./in. 0.2

The conversion factor for impact strength values should be used only to indicate the approximate range of impact strength since the geometry of specimen and notch used in the German tests differs markedly from A.S.T.M. practice.

9—Heated rollers used to dry finished vulcanized fibre



Measuring flow of thermosetting plastics

by L. A. SONTAG and E. F. BORRO*

THERMOSETTING molding materials have the unique property of setting to a hard infusible mass in the relatively short time of a few minutes when molded under heat and pressure. During the transition period the material is capable of flowing, but at a more or less continually changing rate.

The measurement of this ability of thermosetting plastics to flow has taxed the ingenuity of all who have attempted to solve the problem. However, a method published within the last few years by the American Society for Testing Materials, designation D 731–44 T, can be successfully used to analyze this flow quite completely.

From time to time in the past, different methods and equipment for measuring flow have been described in the literature of the industry. Notable examples are the Olsen flow tester, the Bell Telephone Laboratories' multiple orifice mold, the Western Electric Corporation's single orifice mold, the multi-cavity mold, the parallel plate method and the British cup method. Probably the oldest method is based on the principle of measuring the closing time of a cup mold operated at a constant temperature and pressure. Although this system has, for various reasons, been the one most severely criticized it is, nevertheless, the method that is used most widely when others fail as, for example, in the testing of fabric-filled materials. The A.S.T.M. method and the method described in this article are modifications of this old cup method.

In the interest of standardization, the A.S.T.M. method was investigated and found to be quite satisfactory after a few slight modifications. This modified method is limited to measuring the batch-to-batch uniformity of a given plastic. However, it can also be used to distinguish the different characteristics of various types of thermosetting materials. The sensitivity and accuracy of this method are very satisfactory, and it should find wide use in the industry.

* Research Chief and Development Engineer, respectively, Molding Compounds Div., Durez Plastics & Chemicals, Inc.

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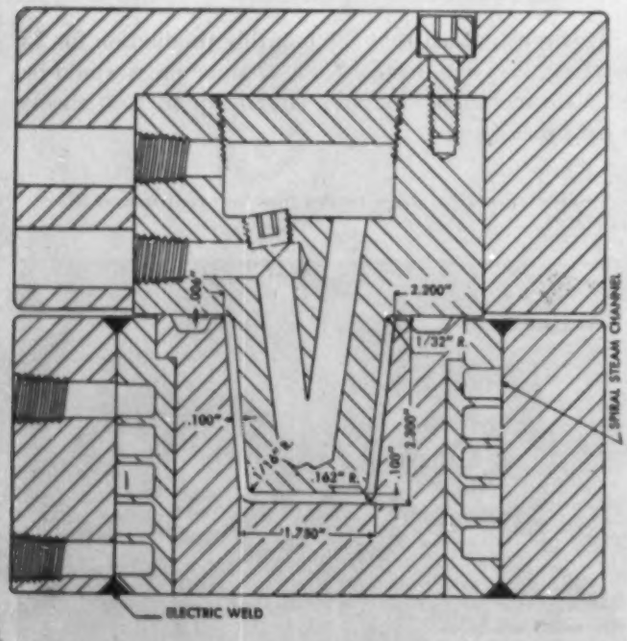


1—A flash type cup mold is essential equipment in the measuring of the flow characteristics of thermosetting plastics by a modification of the cup method

Equipment used in modified cup method

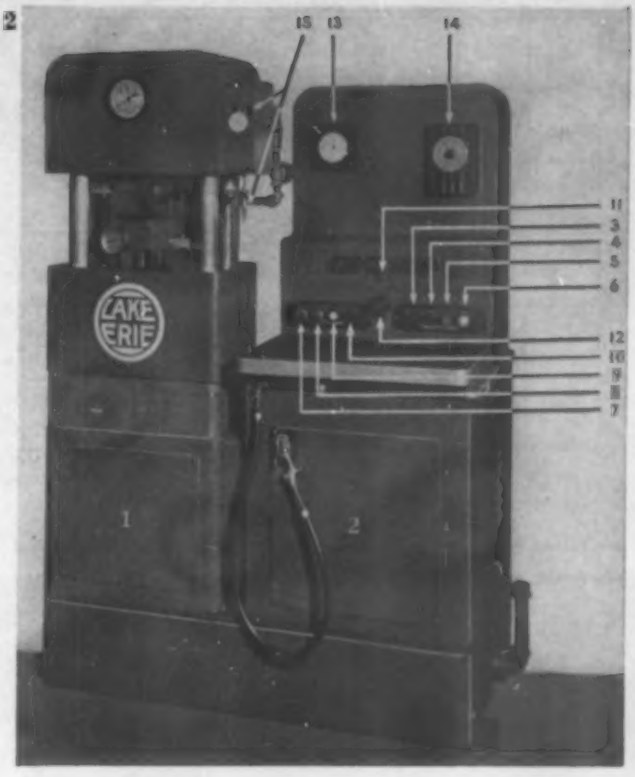
The apparatus consists essentially of a cup mold of the flash type, well cored for steam heating and mounted rigidly in a press capable of applying any of the prescribed pressures uniformly during the closing period. The dimensions of the cup and mold are shown in Fig. 1 and are the same as those in A.S.T.M. designation D 731–44 T. The mold is constructed somewhat differently from those used for ordinary practice. It will be noted that, because of this construction, a fin of less than 0.006 in. cannot be molded.

The press used in this method was designed by Durez Plastics & Chemicals, Inc., engineers in cooperation with Lake Erie Engineering Corp. It is of 15-ton capacity, hydraulically operated with a 4-in. diameter double-acting ram (Fig. 2). The double-acting ram reduced the possibilities of friction to the minimum—a condition essential for accurate test results. The hydraulic pump system is of the variable displacement type with ample capacity to insure uniform press travel at various pressures. The various pressure stages between 2500 and 30,000 lb. are obtained by a separate relief valve mechanically controlled by a gear and rack arrangement (shown at 11 in Fig. 2). To set the desired pressure, a handwheel (12 in Fig. 2) is turned to one of the pressure positions until a 45° latch springs into the pressure position on the rack. This operation requires approximately 3 seconds.

Mold closing time is measured by a combination of a dial indicator, a micrometer (15 in Fig. 2) and a clock (13 in Fig. 2). The clock is started by means of the material resistance within the mold at a total force of 1000 pounds. The clock continues to operate until the press is closed to the required fin thickness of either 0.008 to 0.026 inch. Closing time is then recorded and the clock manually reset to zero for the next test. The mold is steam heated, and it is equipped with a steam-

2—*The press used in testing the flow characteristics of thermosetting plastics. Legend:*

1. *15-ton press, double-acting 4-in. diameter ram.*
2. *Pumping unit, variable displacement, one-way pump.*
3. *Selector switch for 0.008- and 0.026-in. fin.*
4. *Motor starting button.*
5. *Motor stop button.*
6. *Motor light.*
7. *Press closing button for manual operation. Also for energizing automatic action when the selector switch (10) is in automatic position.*
8. *Stop button "manual operation."*
9. *Return stroke button "manual operation."*
10. *Selector switch for manual or automatic action.*
11. *Pressure positions for total press pressures of 2500, 5000, 10,000, 15,000, 20,000, 25,000 and 30,000 pounds.*
12. *Handwheel for selecting predetermined pressures in a desired pressure position (11).*
13. *Mobility timing clock. The clock is energized by resistance of the material within the cavity, at a total force of 1000 pounds. It continues to operate until the mold closes to 0.008- or 0.026-in. fin. It is de-energized by 15.*
14. *Cycle timer for curing.*
15. *Micrometer and dial indicator for original setting of fin thickness and de-energizing switch for 13.*



reducing valve for maintaining proper steam pressure. The mold temperature is indicated by a Weston dial thermometer screwed into the bottom half of the mold.

In the operation of the test, seven different forces are called for—2500, 5000, 10,000, 15,000, 20,000, 25,000 and 30,000 pounds. The projected area of the cup is 3.8 sq. in., and the ram area is 12.6 sq. inches. Therefore, the respective molding pressures required to produce the above forces are 658, 1315, 2630, 3945, 5260, 6575 and 7890 p.s.i., and the oil pressures are 200, 400, 800, 1200, 1600, 2000 and 2400 p.s.i. An ordinary high-quality gage can be used to measure these pressures and obtain a reasonable degree of accuracy over a long period of time. A gage used every day in this manner over a period of one year changes a negligible amount when checked frequently. A special device, consisting of a small piston working against oil in a cylinder provided with a pressure gage previously calibrated against known loads, was used to check the press. This was done by placing it directly over the cavity of the cup mold with the force of the cup mold bearing directly on the piston of the testing device.

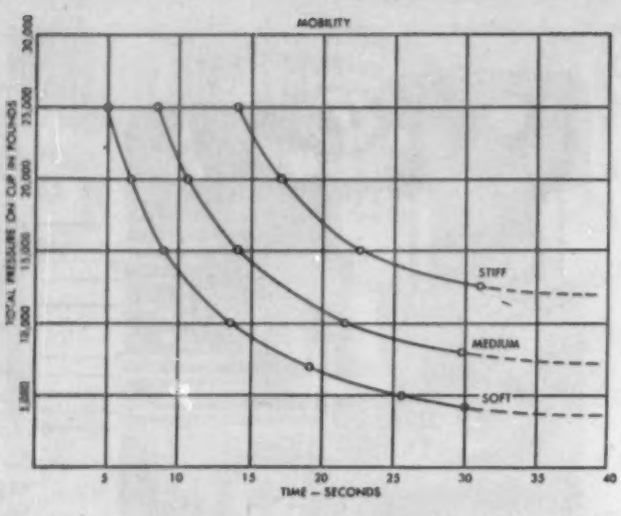
How the test is made

The operation of the test is as follows. The weight of the test sample is first determined by molding a cup under the highest designated pressure, producing a cup having a fin thickness between 0.006 and 0.008 inch. As mentioned previously, the design of the mold prevents a cup with a fin of less than 0.006 in. from being molded. The weight of the cup must be determined by trial and error unless the specific gravity of the molded material is accurately known beforehand, in which case the total charge can be calculated from data for other known materials. The total charge for each test is 1.1 times the weight of the cup minus all flash and fin. In this way the flash is always 10 percent of the weight of the cup.

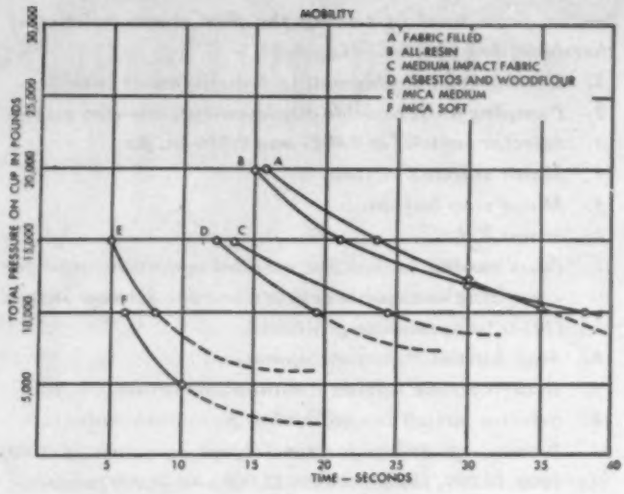
For the initial test on an unknown phenolic general-purpose material, the fin-thickness switch is set for an 0.008-in. opening and a force of 2500 pounds. The time of closing is recorded, provided the material is soft enough to allow the mold to close. In either case, the test is repeated using 5000, 10,000, 15,000, 20,000, 25,000 or 30,000 lb. force, as the material in question may call for, or until a sufficient number of points have been found to draw a curve (as shown in Fig. 3).

This may seem like considerable work to test one material. However, after some experience with the tester, one usually finds that the determination of the closing time under three pressures is sufficient to completely identify flow characteristics of an unknown material, and under one pressure or possibly two for a known material. Running the test under the several pressures also acts as a check on the accuracy of the operator. In Fig. 3 are shown three curves of a general-purpose woodflour-filled phenolic, commonly used in industry, having soft, medium and stiff flow characteristics. For those familiar with the Durez plasticity scale, these correspond to 12, 8 and 6 units.

For determining the flow characteristics of impact materials above 0.5 ft.-lb./in., the same procedure is followed except that the base weight is determined on a cup with a fin under 0.026 in. thick and the fin-thick-



3—Three curves of a general-purpose woodflour-filled phenolic having soft, medium, stiff flow characteristics



4—These curves indicate the flow characteristics of six plastic materials commonly used in the industry

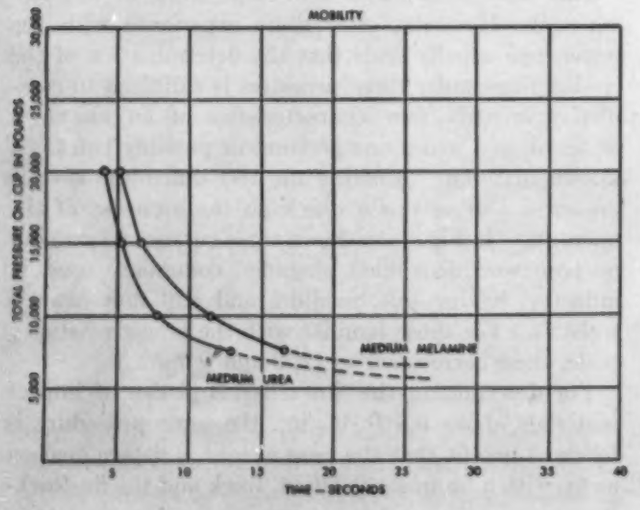
ness switch (15 in Fig. 2) is set for the 0.026-in. opening. This change in the method for impact materials is essential, since it is impossible to cut the fin down much less than 0.026 in. for materials containing fabric and tire cord filler.

What the tests show

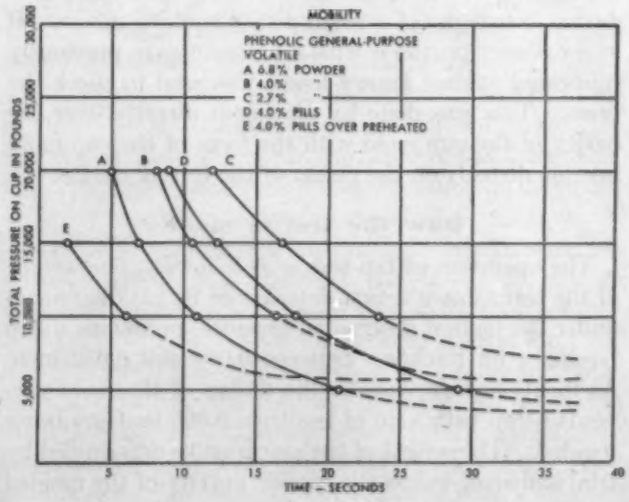
In Figs. 4 and 5 are shown curves for various types of materials commonly used in the industry. Mica-filled phenolics, ureas and melamines have pressure-time curves with steep slopes which appear in the short time portion of the graph. In contrast, general-purpose phenolics have slightly longer flow periods, as shown in Fig. 3. All-resin molding compounds have even longer flow times on low pressures and are consequently more *pressure* sensitive than *time* sensitive. The effect of moisture and preheating on material can also be shown easily by the relative positions of curves in Fig. 6.

The curves for the general-purpose materials have been extended considerably beyond points which have been determined, as indicated by the dotted lines in Fig. 3. The exact location can, however, be determined accurately if desired, but for most purposes it is not essential. Greater accuracy can be obtained by running tests at other than the designated pressures. By testing each material at the designated pressures, it is easily seen that this dotted line becomes parallel with the abscissa between the minimum pressure at which the mold closes and the maximum pressure at which it does not close. The force at which the dotted portion of the curve becomes parallel is the minimum force under which the mold can be closed and can be considered an excellent measure of the flow properties of the plastic. *(Please turn to page 250)*

5—The flow characteristics of medium melamine and urea materials are charted in these two steep slope curves



6—The effects of time and pressure on material is evidenced by relative positions of these five curves



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Tenite AN EASTMAN PLASTIC

Plastics Digest

This digest includes each month the more important articles of interest to those who make or use plastics. Mail request for periodicals directly to publishers.

General

FITTING THE SOLDIER FOR CIVIL LIFE. British Plastics *17*, 501–4 (Dec. 1945). Plastics materials are being used by the British Army in their handicrafts educational program. Illustrations of some of the articles made by the students in one of these courses are given.

THE VERSATILE ALKYDS FIND NEW USES. G. Leffingwell and M. A. Lesser. Chem. Ind. *58*, 60–1 (Jan. 1946). The uses of alkyd resins as bonding and impregnating agents, molding and film-forming materials and emulsifiers and demulsifiers are reviewed.

PLASTICS AND RAYON PREPARE FOR PEACETIME PROGRESS. Chem. & Met. Eng. *53*, 106–7 (Jan. 1946). This is an annual review and forecast for plastics and rayon. Substantial increases for most types of plastics are forecast.

RESEARCH INTO PLASTICS. H. R. Fleck. Plastics (London) *10*, 22–4 (Jan. 1946). This is a general discussion of the value of research in plastics with particular reference to phenolic and amino plastics.

APPLICATION OF CEGLIN SOLUTIONS. Rayon Textile Monthly *26*, 82–4 (Oct. 1945). Ceglin is applied to various textiles to produce permanent finishes. The fabric is treated with a solution of Ceglin which is then coagulated by 1) treating with acid, 2) drying with heat, 3) treating with strong caustic soda or 4) diluting with hot water. Ceglin is a group of alkali-soluble cellulose ethers.

PLASTIC ARMOR. J. O. Lawrie. Chem. & Ind. *1945*, 261–2 (Aug. 25, 1945). Two types of plastic armor consisting of 1) bituminous pitch filled with flint and quartz gravel and 2) pitch filled with sawdust and lime are described. These compositions are used as a facing material on metals. These materials were used effectively on naval craft during the war.

Materials

SOME CHEMICAL CONSIDERATIONS ON THE FORMATION OF PLASTICS FROM COFFEE. O. Ribeiro. Anais. assoc. quim. Brasil *3*, 221–30 (1944); Chem. Abstracts *39*, 5123–4 (Nov. 10, 1945). The formation of plastics by heating coffee with 50 percent hydrochloric acid is attributed to an aldehyde-phenol reaction. The phenol products come from the tannic complex of the coffee and the aldehydes from the hexoses and easily hydrolyzed carbohydrates. The proteins of the coffee form plastics by reacting with the aldehydes. The cellulose acts as a filler.

WATER ABSORPTION OF PLASTICS MOLDED FROM ACYLATED CASEIN. W. G. Gordon, A. E. Brown and C. M. McGory. Ind. Eng. Chem. *38*, 90–4 (Jan. 1946). Acylation of casein by acetic, propionic and butyric anhydrides under various conditions is described. Preparation of acylated products containing 3.4 to 10.1 percent acetyl, 2.7 to 13.4 percent propionyl and 7.5 to 14.9 percent butyryl is discussed. Water absorption tests on disks molded from these materials demonstrated that the affinity of casein for water is curtailed progressively by a) increasing the number of acyl groups incorporated in the modified protein and b) increasing the size of the acyl group. From the standpoint of developing casein plastic molding powders, this reduction in water uptake is not entirely beneficial, since it is accompanied by a decrease in the strength of the molded articles.

WATER RESISTANCE OF PROTEINS. H. S. Olcott and H. Fraenkel-Conrat. Ind. Eng. Chem. *38*, 104–6 (Jan. 1946). Proteins were treated with a number of organic reagents and the products examined for water resistance by measurement of the uptake of water by pressed disks. Aryl and long-chain alkyl isocyanates and also aromatic acid anhydrides and chlorides proved most effective. A number of proteins yielded phenyl isocyanate derivatives showing 24-hour water absorption of 1 to 2 percent. Phthalic anhydride gave products of low water absorption with egg white and cattle hoof. Protein derivatives of low water absorption showed a tendency to plastic flow without addition of water as plasticizer.

PREPARATION OF CELLULOSE ACETATE. C. J. Malm, L. J. Tanghe and B. C. Laird. Ind. Eng. Chem. *38*, 77–82 (Jan. 1946). The amount of combined sulfur was determined at all stages in the manufacture of cellulose acetate, including pretreatment, acetylation and hydrolysis. Little combined sulfur was found during the pretreatment, but after the addition of acetic anhydride, the sulfuric acid combined quantitatively with the cellulose in the intermediate stages of acetylation. At the point where substantially all the hydroxyl groups were esterified, the combined sulfur content began to drop gradually, and as the reaction time was extended beyond the point where it is normally interrupted to initiate the hydrolysis stage, it continued to drop and was replaced by acetyl. The combined sulfur dropped rapidly during the addition of water for hydrolysis. The lowering of the sulfur content was sharply influenced by the temperature and the rate of addition of water. The amount of sulfuric acid catalyst was varied over a thirty-two fold range, and the amount of combined sulfur at the completion of esterification and during hydrolysis was roughly proportional to the concentration of sulfuric acid used. When part of the sulfuric acid was neutralized at the start of hydrolysis, the amount of combined sulfur in the product was determined by the amount of soluble sulfate present during hydrolysis.

EFFECT OF TEMPERATURE ON THE STRUCTURE OF HIGHLY POLYMERIZED HYDROCARBONS. A. Charlesby. Proc. Phys. Soc. *57*, 510–18 (Nov. 1945). The effect of temperature on the structure of polyethylene was investigated over a wide range extending from the temperature of liquid oxygen to temperatures at which polyethylene exists in the liquid condition. As with much lower polymers, the ratio a/b of the two axes increases with temperature, and tends to the value for a pseudo-hexagonal structure, but this value is never attained, since fusion sets in first. A change from a crystalline to an amorphous pattern occurs at temperatures which are below those generally taken as the melting point, but which agree with that for which polyethylene transforms from a wax-like to a more transparent solid. The transition of structure extends over a number of degrees, and in this interval crystalline and amorphous patterns are superimposed. Orientation present in crystalline films is retained when the films are heated to temperatures well above the melting point, and subsequently cooled.

STRUCTURE AND ORIENTATION IN THIN FILMS OF POLYTHENE. A. Charlesby. Proc. Phys. Soc. *57*, 496–509 (Nov. 1945). Thin films of polythene prepared by evaporation from a dilute solution of hot water are crystalline in character. The structure of these films is similar to that of the hydrocarbon described by Bunn, with the following axial spacings in the orthorhombic unit cell: $a = 7.428$ A., $b = 4.9324$ A., $c = 2.532$ A. In addition, however, the molecules are oriented by the action of the hydrophilic vinyl end-group which can only be incorporated in the structure if the molecules

Thermex does a Job for General Industries

Vice President O. W. Marsh and sales manager Steve Hiltebrant of The General Industries Company, Elyria, Ohio, look with satisfaction at one of the Philco radio cabinets perfectly molded by their firm with the aid of THERMEX high frequency heating equipment. THERMEX was originally selected after tests involving various makes of high frequency heating equipment. The selection proved so advantageous that now General Industries uses THERMEX Red Heads on a plant-wide basis...the largest known installation. The Girdler Corporation, Thermex Division, MP-4, Louisville 1, Kentucky. Branch offices: 150 Broadway, New York 7; 228 N. LaSalle St., Chicago 1; 1836 Euclid Ave., Cleveland 15.

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● Preforms are removed from the THERMEX drawer perfectly plasticized—no hard cores—ready for the press. Molds are closed faster and a more certain cure is obtained in shorter time. Greater quantities of the radio cabinet are produced for fewer tool dollars.

● When the mold is opened the net result is a job that will pass inspection with the quality that makes critical customers like Philco come back for more. THERMEX at General Industries has increased the productivity of mold cavities on various jobs from 20% to 75%.

● Typical THERMEX high frequency heating production line at General Industries. This firm is operating batteries of THERMEX Red Heads of various capacities, possibly the largest installation of its kind in the plastics industry. It was possible to fit all of these compact, self-contained units into the plant without rearranging presses.

● In addition to the Philco radio cabinet, General Industries uses THERMEX high frequency heating to streamline the production of many other plastic products. From simple to complex, from small to large, these items are eloquent proof of THERMEX Red Heads' wide range of usefulness in the plastics industry.

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are tilted, so that the *b* axis is parallel to the water surface, while the *c* axis makes an angle of 56° instead of 90° with the water surface. The crystalline character of these thin films of about 1000 A. thickness contrasts with the amorphous structure of polythene in the bulk form. Thin films of polythene may be stretched and their altered structure examined. This is found to consist of crystals in which the *c* axis lies nearly parallel to the direction of the applied stress. The intensity distribution in the electron-diffraction pattern leads one to postulate intermolecular forces which stabilize the crystals in their new positions, until the temperature is raised to the neighborhood of the melting point, when the film reverts to some extent to its initial orientation. On a metal surface, polythene molecules are found to be relatively mobile. They may be oriented mechanically to produce a structure basically similar to that of stretched films. Polythene emulsion has a structure very different from that of the crystalline film and may in fact be described as of an amorphous character. There is, however, some evidence of a small proportion of crystalline polythene. The structure of the emulsion shows great similarity to that of liquid polythene.

Molding and Fabricating

RESISTANCE PREHEATING OF MOLDING MATERIALS. C. G. Phillips. British Plastics *17*, 527–8 (Dec. 1945). Graphite is incorporated in plastic molding materials to make them partial conductors of electricity. Preheating can then be accomplished by the application of a suitable voltage. This method is cheaper than high frequency heating. However, it cannot be used for light-colored, transparent or electrical insulating parts.

Applications

LINING TANKS WITH VINIDUR. Plastics (London) *9*, 609–17 (Dec. 1945). This is a translation of a German article by A. Sirot in Kunststoffe *33*, 33–9 (1943). Procedures for lining tanks of metal, wood and concrete with polyvinyl chloride films and sheeting are described.

PRODUCING BETTER PRINTING INKS. P. Pollack. Plastics (Chicago) *4*, 34, 36–8, 123 (Jan. 1946). The formulation of printing inks from synthetic resins is discussed.

EXTENDING PHENOLIC RESIN PLYWOOD ADHESIVE WITH CORN GLUTEN AND SOYBEAN MEAL. G. E. Babcock and A. K. Smith. U. S. Dept. Agr., Northern Regional Research Lab., AIC-65, 6 pages (1945). A special type of low-molecular-weight phenol-formaldehyde resin and the method of combining it with protein materials, such as corn gluten and soybean meal, to produce a plywood glue are described. Plywood properties prepared with this glue are given.

ICELESS PACK FOR SEAFOOD—AIR-BORNE. S. A. Larsen. Modern Packaging *19*, 104–7 (Dec. 1945). Chlorinated rubber film has been found satisfactory for packaging seafood for transport and distribution.

PHYSIOTHERAPIST HAS ACRYLIC ENCLOSING SECTION. Pacific Plastics *3*, 32–3 (Dec. 1945). The Blanchard Mechanical Physiotherapist for treating circulatory and respiratory diseases is described. The body section consists of a transparent acrylic plastic.

NOTES ON THE OPTICS OF ORGANIC GLASSES. G. A. Boutry. Rev. optique (L'Optique théorique et instrumentale en 1941) *20*, 5–25 (1941); Chem. Abstracts *39*, 4775 (Oct. 20, 1945). The molding of lenses, prisms, slabs and blocks from styrene, vinyl and acrylic plastics was investigated. The pieces can be produced with optical surfaces, are free of internal strains, are isotropic, and have reproducible indices of refraction. It is possible to produce combinations with indices of refraction, dispersions and absorptive properties heretofore unrealized with mineral glasses.

ALKYD RESINS IN PRINTING INKS. G. Leffingwell and M. A. Lesser. Am. Inkmaker *23*, No. 8, 21–4 (1945). A review of the use of alkyd resins in printing inks. Twenty-two references.

IMPREGNATION OF VEGETABLE SOLE LEATHER WITH SYNTHETIC RESINS AS A MEANS OF IMPROVING WEAR. J. G. Niedercorn and F. D. Thayer. J. Am. Leather Chem. Assoc. *40*, 242–51 (1945). Sole leather was impregnated with emulsions and solutions of various resins and cellulose derivatives. Only small amounts could be introduced by this technique. The increase in abrasion resistance was inappreciable. Oils, which are taken up by leather in greater amounts, were more effective in increasing resistance to abrasion.

PLASTICS IN LEATHER MANUFACTURE. E. Cass-Smith. Leather World *37*, 408–12 (1945). The use of plastics as tanning agents and for improving the properties of leather is discussed.

SILICONES—A NEW CLASS OF HIGH POLYMERS OF INTEREST TO RADIO INDUSTRY. S. L. Bass and T. A. Kauppi. Proc. Inst. Radio Engrs. *33*, 441–7 (1945). The production and properties of the silicone resins are described. Various applications of these new polymers in radio are discussed.

NEW CORK INSULATING MATERIALS FOR PROTECTION AGAINST COLD. J. S. Cammerer. Holz Roh- u. Werkstoff *4*, 129–34 (1941); Chem. Abstracts *39*, 5360–1 (Nov. 20, 1945). Various insulating materials were investigated to determine absorption of water vapor and water, capillary absorption on partial immersion in water, and resistance to fungus attack. The materials tested included cork, synthetic resin foams, mineral wool, sawdust, wood wool, pulp and paper boards, straw, reeds, flax and hemp chaff. Synthetic resin foams were most satisfactory in these tests but are expensive.

PLASTICS IMPROVE DESIGN OF COMPASS. D. J. Faustman. Machine Design *18*, 132–4, 182 (Jan. 1946). A compass made largely of plastic parts is described and compared with one made largely of metal parts. The plastic one weighs 15 oz., the metal one 9 pounds. Cellulose acetate butyrate and methyl methacrylate plastics are used in the plastics compass.

PLASTICS AND FASHIONS. J. Veit and H. Beresford. British Plastics *17*, 497–500 (Dec. 1945). The application of plastics in hats, belts, shoes and trimmings for clothing are discussed from the viewpoints of manufacture and design.

Coatings

PLASTIC RESINS AS PROTECTIVE COATINGS. P. O. Blackmore. Product Eng. *17*, 1–7 (Jan. 1946). The applications, limitations and future possibilities of protective coatings formulated with liquid plastics are discussed. Alkyd, cellulose nitrate, acrylic, phenolic, urea, melamine, vinyl, vinylidene chloride, styrene and silicone types are considered in regard to their utility in commercial finishes. The ballyhoo regarding "plastic paints" is once more exposed.

SYNTHETIC RESINS FOR BREWERY-TANK COATINGS. H. W. Foelsch. Brewers Digest *20*, No. 8, 47–9, 52 (T89–91, 94) (1945). Coatings are applied to brewery tanks to protect the beer from metallic contamination. Satisfactory coatings must be odorless, tasteless, nontoxic, hard, smooth, steam resistant, durable and easily repaired. Test methods to evaluate coatings for this purpose and the results of some preliminary tests are described. Phenolic, urea, melamine, alkyd, vinyl, cellulosic and acrylic plastic coatings have been used.

PROPERTIES AND USES OF SOME UNITED STATES PAINT MATERIALS. H. Gardner and M. W. Westgate. Paint Manuf. *15*, 205–6 (1945). Properties and possible applications of pentaerythritol, pentaerythritol esters, trimethylolpropane, some related replacements and sodium carboxymethylcellulose are discussed.

APPLIED FINISHES STANDARDIZATION AND BASIC PRINCIPLES OF PROCEDURE. S. B. Ashkinazy. Product Eng. *17*, 24–8 (Jan. 1946). The principles and practices underlying the selection and establishment of standards for applied finishes for specific engineering and manufacturing requirements are discussed. Specifications are also discussed.

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Technical Briefs

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Engineering

IMPROVED SYNTHETIC ION EXCHANGE RESIN. W. C. Bauman. Ind. Eng. Chem. *38*, 46–50 (Jan. 1946). An improved cation exchange resin of the phenol-formaldehyde type containing nuclear sulfonic acid groups is now available. The exchange capacity of this resin is higher than previously known cation exchange materials in both sodium and acid cycles. The resin is stable and without color throw over a wide range of pH up to 100° C. and shows excellent stability to rapid changes in salt concentration. Field tests on the material have been run in both water softening and demineralization for three years.

TWO STANDARD METHODS FOR CURING RESIN FINISHES. J. W. Reinhardt. Rayon Textile Monthly *26*, 109–10 (Sept. 1945). After a fabric is treated with resin and dried the resin has to be cured. The resin may be cured by either a loop curer or a roller curer. These two types of equipment are described.

DERMATITIS FROM SYNTHETIC RESINS. L. Schwartz. J. Investigative Dermatology *6*, 239–55 (Aug. 1945). Dermatitis resulting from contact with various synthetic resins is discussed. Preventive and curative measures for dermatitis resulting from the synthetic resins and chemicals used with them are given.

FRICTION BRAKE LININGS—TYPES, USES AND DESIGN DATA. Product Eng. *17*, 39–43 (Jan. 1946). Brake linings can be classified as 1) woven, 2) fabric, 3) dry mixed, 4) wire back, 5) extruded and 6) sheeter type. The construction of the various types, applications and design are discussed.

ACETYLENE BLACK AND CONDUCTIVITY. R. H. Hall, B. P. Buckley and T. R. Griffith. Can. Chem. & Process Ind. *29*, 587–90 (Aug. 1945). Rubbers and plastics which are normally insulators can be made electrically conductive by the incorporation of acetylene or other blacks. Such conductive materials have many practical applications, such as: a) semi-conductive flooring to ground electrostatic charges; b) electrically conductive belting; c) electric heaters for de-icing devices on aircraft; d) resistors in radio and electrical equipment; e) electrically conducting adhesives that use electric heat to cure the adhesive, and others. The high conductivity of polymers containing acetylene black is due not only to the degree of graphitization and therefore conductivity of the individual particles, but also to the extent to which they are joined in clusters. The latter property is shown to have a direct relation with resulting conductivity. Any mechanical process which might destroy the black structure will therefore increase resistivity; variations may be due to nonuniformity of the disintegration.

Chemistry

COPOLYMERIZATION OF STYRENE AND MALEIC ANHYDRIDE. T. Alfrey and E. Lavin. J. Am. Chem. Soc. *67*, 2044–5 (Nov. 1945). Experiments of the copolymerization of styrene and maleic anhydride are described.

POLYMERIZATION OF ALPHA-METHYLSTYRENE. A. B. Hersberger, J. C. Reid and R. G. Heiligmann. Ind. Eng. Chem. *37*, 1073–8 (Nov. 1945). α-Methylstyrene was polymerized by solutions of Friedel-Crafts catalysts in organic solvents at temperatures as low as −130° C. to molecular weights as high as 84,000. The highly polymerized product includes a wide range of molecular weights as shown by distribution curves based on fractional precipitation. This polymer is not distorted in boiling water and has a higher fusion point than polystyrene but is inferior in strength to the latter. A copolymer of isobutylene and α-methylstyrene which can be formed into strong, thin, flexible sheets was made by the same polymerization technique. The emulsion copolymerization of butadiene and α-methylstyrene yields an elastomer comparable to that now obtained from butadiene and styrene; the optimum ratio of butadiene to α-methylstyrene contains a greater proportion of butadiene than is used with styrene. In this copolymerization α-methylstyrene has advantages of stability, ease of handling as compared to styrene.

METHACRYLYLUREA AND N-PHENYL-N′-METHACRYLYLUREA. R. A. Jacobson. J. Am. Chem. Soc. *67*, 1998–9 (Nov. 1945). Methacrylylurea and N-phenyl-N′-methacrylylurea were prepared by the reaction of methyl methacrylate with monosodium urea and monosodium phenylurea, respectively. Methacrylylurea polymerizes readily when heated in alcohol solution in the presence of benzoyl peroxide. The polymer is insoluble in water and in organic solvents.

INITIAL PRODUCTS OF CONDENSATION OF UREA WITH FORMALDEHYDE. D. N. Vaskevich and L. A. Sabun. J. Gen. Chem. (U. S. S. R.) *14*, 292–8 (1944); Chem. Abstracts *39*, 3785 (Sept. 10, 1945). The condensation reaction between urea and formaldehyde was investigated. The time-viscosity curves and analyses of the products show the formation of definite compounds. The formation of cyclic compounds rather than chain compounds is indicated in this technical article.

HYDROLYSIS AND CATALYTIC OXIDATION OF CELLULOSIC MATERIALS. R. F. Nickerson and J. A. Habrle. Ind. Eng. Chem. *37*, 1115–18 (Nov. 1945). Glucose, cellobiose, cotton linters and a series of derived hydrocelluloses were examined by the hydrolysis-oxidation method for the purpose of obtaining more information on linters structure and on the method itself. Carbon dioxide evolution data for these materials and for a dextrose-hydrocellulose mixture that simulates intact linters are reported. Other variables investigated include moisture adsorption and insoluble matter recoverable after hydrolysis-oxidation runs. The linters starting material appears to contain, as distinguishable parts, highly disordered, highly ordered, and transitional components in amounts by weight of approximately 3, 94 and 3 percent, respectively. The highly disordered component is readily differentiated by its hygroscopic nature and hydrolytic susceptibility, the crystalline or ordered component, by its uniformly low hydrolytic reactivity. A single hydrolysis-oxidation run is probably insufficient to characterize a sample, but the differential approach may be used advantageously.

Properties

THE ACTION OF ULTRAVIOLET LIGHT ON CELLULOSE AND CELLULOSE TRIACETATE. E. Heuser and G. N. Chamberlin. J. Am. Chem. Soc. *68*, 79–83 (Jan. 1946). Ultraviolet irradiation of cellulose in a helium atmosphere produces the same changes as in nitrogen, which would seem to rule out the possibility that the changes earlier observed in nitrogen resulted from the hydrolysis of cellulose by nitrogen oxides in the presence of water. Samples irradiated either in nitrogen or in helium undergo the post-irradiation effect. Likewise, helium may be used instead of nitrogen for inhibiting the post-irradiation effect. In contrast to cellulose, the reducing power of cellulose triacetate is not increased by ir-

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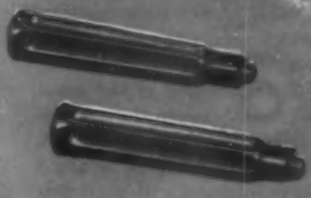

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radiation in nitrogen, and its acetyl content remains unchanged. However, on irradiation in oxygen, far-reaching deacetylation occurs and copper number and uronic acidity increase considerably. The increase of the latter shows that hydroxyl groups in the 6 positions are oxidized. That cellulose triacetate irradiated in nitrogen suffers a pronounced post-irradiation effect, seems to show that, in cellulose itself, the hydroxyl groups are not essentially involved in that part of the irradiation reaction which leaves the glycosidic linkages in a condition unstable to oxygen. Oxygen allowed to act upon cellulose triacetate with ultraviolet light excluded produces no changes in the degree of polymerization, copper number and uronic acid. The behavior of cellulose triacetate which has been irradiated in an oxygen atmosphere toward storage in nitrogen and in oxygen is much the same as previously observed with cellulose itself under the same conditions.

GAS-PERMEABILITY AND MICROSTRUCTURE OF HIGH-POLYMERIC COMPOUNDS. S. A. Reitlinger. J. Gen. Chem. (U. S. S. R.) *14*, 420–7 (1944); Chem. Abstracts *39*, 4776 (Oct. 20, 1945). Gas-permeability increases as the curvature of the primary valence chain and size of the side chains are increased and as the energy of intermolecular bonding is decreased. It is independent of the primary-valence chains. Crepe rubber, polybutadiene, guttapercha, polychloroprene, butadiene-styrene copolymer, butadiene-acrylonitrile copolymer, polyethylene, polyisobutylene, polystyrene, polyvinyl acetate, polyvinyl chloride, polyvinyl alcohol were investigated.

EFFECT OF TEMPERATURE ON THE STRENGTH PROPERTIES OF WOOD, PLYWOOD AND GLUED JOINTS. P. H. Sulzberger. J. Council Sci. Ind. Research (Australia) *16*, 263–5 (1943). The strength properties of wood, plywood and glued joints were determined over the temperature range −10 to 50° C. and at varying moisture contents up to 15 percent. The temperature effects are appreciable. It is recommended that a standard temperature be adopted for testing these materials.

PROPERTIES OF PLASTICS AS A FUNCTION OF THEIR MOLECULAR STRUCTURE. W. S. Penn. Plastics (London) *10*, 33–42 (Jan. 1946). The relations between chain length, solubility, distribution of molecular weight, chemical constitution, size and nature of lateral groups, nature of chemical bonds, branching, strength and tracking resistance of plastics are reviewed.

PROPERTIES OF SYNTHETIC FIBERS—KEY TO PROPER USE AND POTENTIALITIES. Textile World *95*, 117–32 (Sept. 1945). The properties of commercial synthetic fibers are compared. All synthetic commercial yarns available, pertinent statistics, new fibers and comparative stress-strain curves are given. This is the 21st annual synthetics survey of the Textile World.

Testing

CHEMICAL ANALYSIS AND STRUCTURE DETERMINATION OF PLASTICS. W. Esch and R. Nitsche. Wiss. Abhandl. deut. Materialprüfungsanstalt 2, No. 1, 22–9 (1941); Chem. Abstracts *39*, 4518 (Oct. 10, 1945). Plastics are identified by noting the effects of heat, the odor of the products of thermal decomposition and their chemical composition. Procedures for the quantitative analysis of phenolic and urea resins and for determining the plasticizer and filler contents of thermoplastic compositions are reported. The fillers in phenolic and urea plastics can be determined by extracting the resins. This is accomplished by immersing the sample in molten naphthol at 160 to 180° C. for 24 hr., soaking in a boiling 1 to 3 mixture of ethyl alcohol and benzene, and extracting with ether.

THE DEPOLARIZATION OF LIGHT SCATTERED FROM POLYMER SOLUTIONS. P. Doty and H. S. Kaufman. J. Phys. Chem. *49*, 583–95 (Nov. 1945). The theory of depolarization of scattered light is developed with particular reference to the study of polymer molecules in solution. A simple apparatus, based on the Cornu method, is described. This permits the measurement of the depolarization of the transversely scattered light, using unpolarized and vertically and horizontally polarized incident light. Measurements on fractions of cellulose acetate, polyvinyl chloride and polystyrene as a function of molecular weight, concentration and solvent are reported. The data are interpreted in terms of the changes in anisotropy and size as a function of the above-mentioned variables.

MICROSCOPIC EXAMINATION OF PLASTIC MATERIALS. J. H. Wredden. Plastics (London) *9*, 553–61, 594–601 (Nov. and Dec. 1945). The results of the microscopic examination of insulatng sleevings made of 1) cotton, rayon or silk fabric tubing which is coated with oleoresinous varnishes, polyvinyl acetate or polyvinyl chloride, 2) polyvinyl chloride tubing, 3) polyvinyl chloride with an external sheath of cotton or silk braid are described. See abstract of similar title on page 174 of Jan. 1946 issue of MODERN PLASTICS.

HARDNESS TESTING OF VULCANIZED ELASTOMERS. Rubber Chem. Tech. *18*, 448–51 (1945). The various methods for measuring the hardness of elastomers are described. A chart for converting the various hardness values from one to another is given.

FLAVOR RETENTION WITH ORGANIC PACKAGING MATERIALS. E. C. Crocker. Modern Packaging *19*, 147–50 (Dec. 1945). The effect of organic packaging materials on flavor and aroma of food products is discussed. A simple test procedure for determining the effect of these materials on flavor and aroma is described.

Synthetic Rubber

OBSERVATIONS ON THE REACTIONS OF COPPER AND SULPHUR. C. M. Blow and G. Hopkins. J. Soc. Chem. Ind. *64*, 316 (Nov. 1945). To throw light on the chemical reactions involved in the bonding of rubber to brass-plated metal, experiments are described to observe the reaction of sulfur with copper in a paraffin medium. It is shown that another factor must be taken into account in considering the reactions of rubber and sulfur, and brass and sulfur in the bonding of rubber, namely, the reaction of copper and accelerator. The latter substance affects both the rubber-sulfur and the copper-sulfur reactions.

QUALITATIVE SPOT TESTS FOR RUBBER POLYMERS. H. P. Burchfield. Ind. Eng. Chem., Anal. Ed. *17*, 806–10 (Dec. 1945). A new color reaction is described which serves to characterize natural rubber, GR-S, and Perbunan. Confirmatory tests included in the same operation distinguish between the remaining commercially important types. A rapid and definite distinction can be made by reacting the pyrolyzates with materials capable of condensing with compounds containing labile hydrogen atoms. Of the reagents investigated, *p*-dimethylaminobenzaldehyde was found to be the most effective, and yields colored condensation products with the distillates from a number of polymers, which are sufficiently characteristic to serve as criteria of identity. The reaction is carried out by distilling the pyrolyzate from a rubber sample into a dilute alcoholic hydrochloric acid solution of the aldehyde. An initial color is produced which is intensified and altered by diluting the reaction mixture with methanol and heating on a water bath. The distillate from natural rubber produces an intense violet-blue and that from GR-S a green. Perbunan yields a red product, neoprene a yellow-green and Butyl a blue-green of comparatively low intensity. For routine assortment of scrap, spot tests are proposed, which are carried out by holding filter paper strips impregnated with the chemicals in the smoke emitted when the sample is branded with a metal rod heated to redness. Color changes indicate the nature of the polymer. Laboratory methods of value in examination of special samples are discussed.

MAKING FLEXIBLE MOLDS FROM NEOPRENE LATEX. H. H. Abernathy and R. H. Walsh. Rubber Age *58*, 349–51 (Dec. 1945). The procedure for making flexible molds from neoprene latex is described.

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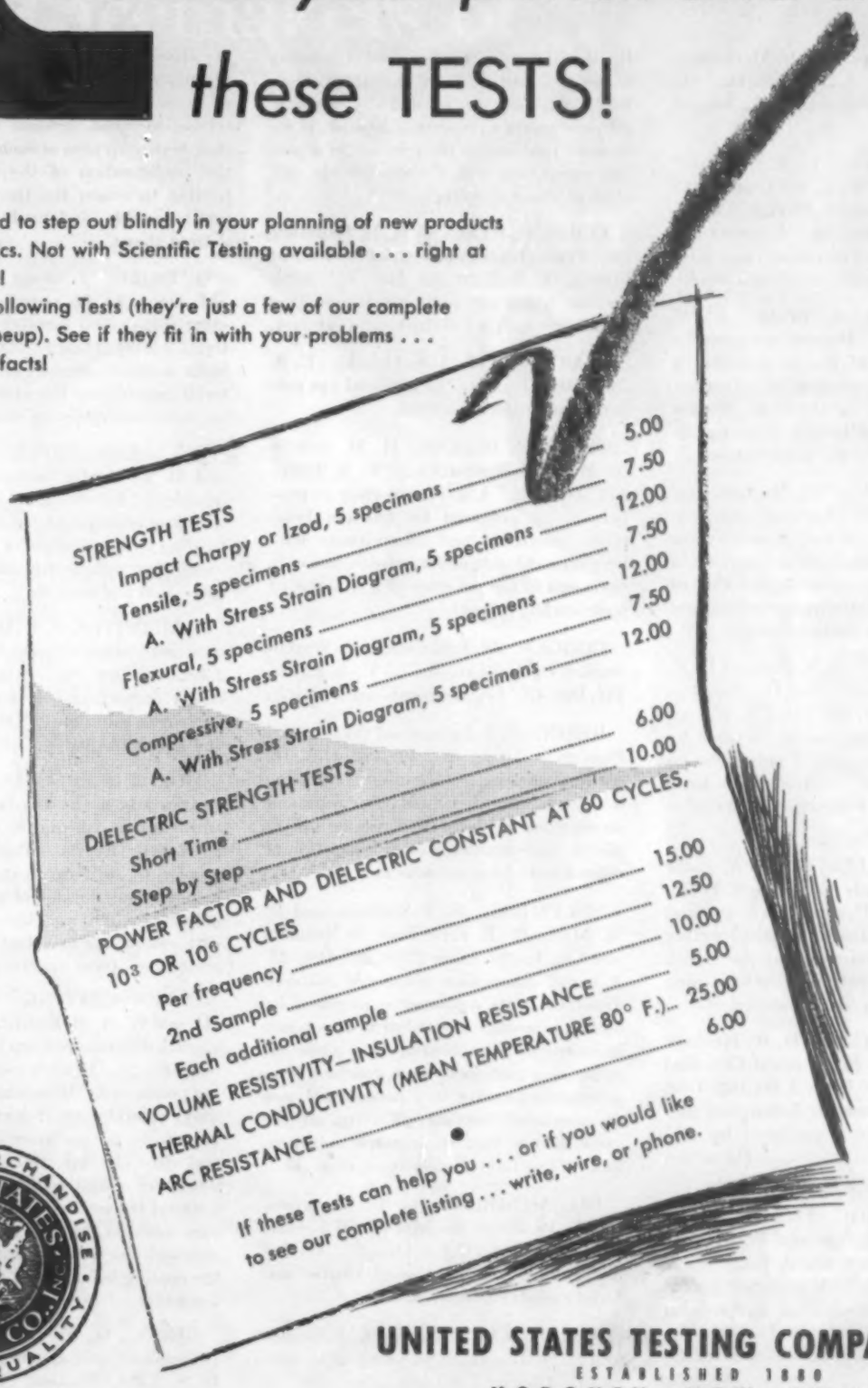

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U. S. Plastics Patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each.

DIE. C. F. Marschner (to McDonnell Aircraft Corp.). U. S. 2,390,803, Dec. 11. A die set for producing marginally flanged plastic parts.

CABLE BLOCKS. L. T. Komives, J. W. Courtis and D. E. F. Thomas (to International Standard Electric Corp.). U. S. 2,391,055, Dec. 18. A polymerizable liquid is inserted in a sheath and polymerized around a cable, forming a block.

BRUSHES. O. W. Sticht. U. S. 2,391,077, Dec. 18. Brushes are made by providing a tube of fibrous material, a tuft of hair and a solution of a thermoplastic resin, applying the resin solution to an end portion of the tuft, inserting tuft into tube and fusing the thermoplastic.

POLYSTYRENE. W. Horback (to Celanese Corp. of America). U. S. 2,391,092, Dec. 18. Sheets of polystyrene are prepared by dissolving polystyrene in a solvent such as aromatic, chlorinated aliphatic, or aromatic hydrocarbons and an alcohol which is a non-solvent.

POLYMERS. H. B. Kellog and P. K. Frolich (to Standard Oil Development Co.). U. S. 2,391,095, Dec. 18. Cured interpolymers of ethylene are prepared by subjecting ethylene and a poly-olefin to interpolymerization conditions at more than 500 atm. of pressure and thereafter heating with sulfur.

ARTIFICIAL TEETH. J. A. Saffir (to Dentist's Supply Co. of New York). U. S. 2,391,106, Dec. 18. An artificial tooth is molded in a form held together by a synthetic resinous material which decomposes at a point below the hardening temperature of the tooth material.

INTERPOLYMERS. D. W. Heubner and J. E. Fearey (to Imperial Chemical Industries, Ltd.). U. S. 2,391,162, Dec. 18. An interpolymer of isobutylene and vinyl methacrylate is produced by subjecting a mixture of the two to the action of boron trifluoride at below −10° C.

PHOTOGRAPHIC FILM. L. M. Minsk, W. J. Weyerts and W. H. McDowell (to Eastman Kodak Co.). U. S. 2,391,181, Dec. 18. A sensitive photographic element comprising an emulsion layer and a protective layer of a methacrylic acid, methacrylic ester copolymer.

UTENSIL. W. C. P. Zabel and R. C. Helfenbein. U. S. 2,391,215, Dec. 18. A culinary strainer composed of plastic.

POLYMERS. R. G. R. Bacon and R. B. Richards (to Imperial Chemical Industries, Ltd.). U. S. 2,391,218, Dec. 18. Polymers are formed by heating ethylene under a pressure of 50 atm., in an aqueous medium, in the presence of a peroxy compound and a water-soluble salt of an oxy acid of sulfur.

TERPENE RESINS. W. H. Carmody (to Pennsylvania Industrial Chemical Corp.). U. S. 2,391,293, Dec. 18. Solid terpene resins are prepared by reacting turpentine with a Friedel-Crafts catalyst.

PLASTIC EYE. J. S. Galeski. U. S. 2,391,305, Dec. 18. An artificial eye prepared from plastic material.

TERPENE RESINS. H. M. Spurlin (to Hercules Powder Co.). U. S. 2,391,359, Dec. 18. A solid, colorless terpene polymer is prepared by treating beta-pinene, myrcene and allo-ocimene with beryllium chloride under anhydrous conditions and in the presence of a chlorinated hydrocarbon solvent.

GOGGLE. W. J. Stevenson (to Watchemoket Optical Co., Inc.). U. S. 2,391,361, Dec. 18. Goggles composed of plastic.

RESIN. G. J. Underwood (to Hercules Powder Co.). U. S. 2,391,368, Dec. 18. An impregnating composition comprising a water-soluble phenol-aldehyde resin and an aqueous emulsion of a residue low in abietic acid remaining after separation of refined rosin from resinous material.

POLYMERS. R. T. Coffman and B. M. Marks (to E. I. du Pont de Nemours and Co., Inc.). U. S. 2,391,393, Dec. 25. A syrup comprising polymeric material dissolved in its monomer is prepared by adding monomer to a solution of polymer in monomer at a constant rate while the syrup is maintained at a constant temperature conducive to a ratio of polymer to monomer, drawing off syrup at the same rate as that of monomer addition, and cooling immediately upon removal.

DIE MEMBERS. C. F. Marschner and E. W. Bryan (to McDonnell Aircraft Corp.). U. S. 2,391,432, Dec. 25. Molded die members of transparent plastic material containing resistance wire.

MOLDED ARTICLES. A. J. Stamm and H. D. Turner (to Secretary of Agriculture). U. S. 2,391,489, Dec. 25. A method of molding laminated articles comprising impregnating sheets of porous material with a thermosetting material, precompressing the sheets at a temperature at which the thermosetting material is plastic, cooling while in compressed form so as to temporarily solidify the thermosetting material, holding in precompression, laying up plies of such sheets to form the configuration of the finished piece, heating to render the thermosetting material flowable, and finally curing in the desired shape.

OUTSOLE. J. Gregg. U. S. 2,391,564, Dec. 25. An outsole comprising an inner sole-shaped member of porous material, a layer of textile fabric enclosing the inner member, strands of thermoset material penetrating the inner member and an outer waterproofing coating.

CELLULOSE ESTERS. C. I. Haney and M. E. Martin (to Celanese Corp. of America). U. S. 2,391,569, Dec. 25. Cellulose is prepared for esterification by treating with a mixture of fatty acids and formic and sulfuric acids until the desired activation has occurred.

COMPOSITES. A. K. Doolittle (to Carbide and Carbon Chemicals Corp.). U. S. 2,391,619, Dec. 25. Paper is coated by briefly contacting only an extended surface with a solution of a vinyl resin, drying, and finally baking.

MOISTUREPROOFING. R. W. Quarles and A. K. Doolittle (to Carbide and Carbon Chemicals Corp.). U. S. 2,391,620, Dec. 25. Paper is moistureproofed by forming on its surface a non-homogeneous deposit of a resinous vinyl polymer and a wax incompatible therewith and baking to a clear non-tacky composite film of wax and vinyl polymer.

PAPER COATING. G. M. Powell, III, and W. H. McKnight (to Carbide and Carbon Chemicals Corp.). U. S. 2,391,621, Dec. 25. Paper is coated with a coating prepared by dispersing a copolymer of vinyl chloride, vinyl acetate and maleic anhydride, a copolymer of vinyl acetate and vinyl chloride, and a paraffin wax in a mixture of methyl ethyl ketone, methyl isobutyl ketone, and hydrogenated petroleum naphtha, heating above the melting point of the wax, cooling and agitating, the coating being baked after applying to the paper.

RESIN. G. F. D'Alelio and J. W. Underwood (to General Electric Co.). U. S. 2,391,683, Dec. 25. The resinous reaction product of a chlorinated acetamide and a product of partial reaction between formaldehyde and one of a diazine derivative. *(Please turn to next page)*

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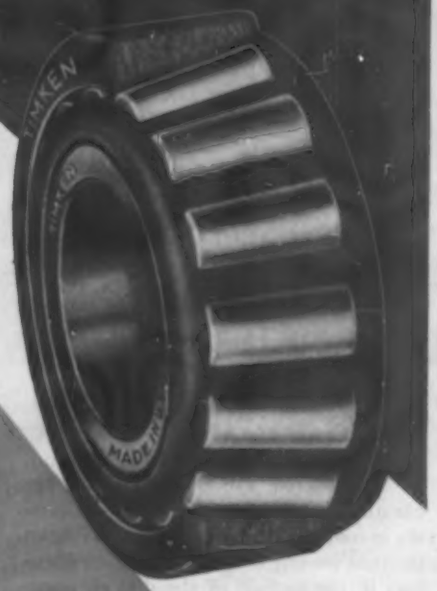

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TEXTILE FINISHING. J. A. Clark (to Sylvia Industrial Corp.). U. S. 2,391,867, Jan. 1. A pile fabric is finished by back-filling with a composition comprising a dispersion in an aqueous solution of alkali, an alkali-soluble water-insoluble cellulose hydroxy-alkyl ether and rubber latex, conjointly coagulating the rubber and the cellulose ether on the fabric, thereby forming a continuous permanent finish on the fabric.

POLYETHYLENE. M. D. Peterson (to E. I. du Pont de Nemours and Co., Inc.). U. S. 2,391,920, Jan. 1. Ethylene is polymerized by heating ethylene in the presence of a dialkyl dioxide.

SUNBATHING APPAREL. G. Gallowhur. U. S. 2,391,959, Jan. 1. Sunbathing apparel made of thin, flexible, translucent, thermoplastic sheets containing ultraviolet light filtering agents which serve to permit passage of the pigmenting range of ultraviolet radiation, but suppress the erythema range.

ARTIFICIAL FILAMENTS. A. S. Hunter (to E. I. du Pont de Nemours and Co., Inc.). U. S. 2,391,973, Jan. 1. An apparatus for producing artificial filaments from synthetic filament-forming materials.

PROTECTIVE COATING. L. L. Leach (to E. I. du Pont de Nemours and Co., Inc.). U. S. 2,391,986, Jan. 1. Rubber sheet having a tacky surface and a protective covering comprising a self-sustaining plasticized preformed film of a water-soluble polyvinyl alcohol.

POLVINYL ACETAL. F. Groff (to Carbide and Carbon Chemicals Corp.). U. S. 2,392,041, Jan. 1. A plastic composition resistant to change in color on exposure to light and heat, comprising a polyvinyl partial acetal resin physically admixed with thiourea or a derivative.

LAMINATING APPARATUS. E. L. Vidal and W. A. Taylor (to Vidal Corp.). U. S. 2,392,108, Jan. 1. A molding apparatus for lamination molding comprising in combination a molding die having an internal venting conduit connecting openings in the surface of the die, an open-mouthed jacket of membranous material enclosing the die, and a nozzle member passing through the mouth of the jacket into the conduit to give a common mouth to the jacket and the die, said member having a bulbous portion of resilient material sealingly engaging the conduit walls and sealing the space between the jacket and die adjacent the jacket mouth.

GLASS LAMINATE. D. T. Downes (to Pittsburgh Plate Glass Co.). U. S. 2,392,129, Jan. 1. A closure structure comprising glass sheets bonded to an organic plastic interlayer and having their edges extending beyond the interlayer to define a channel which is filled with a rubber compound adhering to the glass and which surrounds an inner metallic member.

POLYMERS. H. Dreyfus. U. S. 2,392,121-2, Jan. 1. Linear polymers are produced by heating a reaction mass containing substituted urea or thiourea containing methylene groups until film-forming properties are produced.

COATING. H. O. Farr, Jr. (to Pittsburgh Plate Glass Co.). U. S. 2,392,135, Jan. 1. A suspension of a non-cohering powder of vinyl chloride-acetate copolymer in water which contains plasticizer for the polymer.

COPOLYMER. H. L. Gerhart (to Pittsburgh Plate Glass Co.). U. S. 2,392,139, Jan. 1. A clear hard plastic composition consisting of the copolymer of maleic anhydride and styrene in molar ratio, the polymerization being carried out in the presence of cyclohexanone.

RESIN. H. L. Gerhart (to Pittsburgh Plate Glass Co.). U. S. 2,392,140, Jan. 1. A copolymer of cyclopentadiene and an unsaturated glyceride oil is prepared by heating in a closed container under pressure.

WRINKLE FINISH. W. A. Waldie (to New Wrinkle, Inc.). U. S. 2,392,346, Jan. 8. A wrinkle composition consisting of the heat reaction product of an oil-soluble resin such as natural resin, rosin-modified alkyd resins, or a phenol-aldehyde resin with unblown drying oil, and a polycarboxylic acid.

CELLULOSE DERIVATIVE. J. N. Borglin (to Hercules Powder Co.). U. S. 2,392,359, Jan. 8. A thiocyanoacyl ester of cellulose.

RESIN. G. F. D'Alelio and J. W. Underwood (to General Electric Co.). U. S. 2,392,366, Jan. 8. The reaction product of formaldehyde and one of a triazine derivative.

COPOLYMERS. W. E. Hanford (to E. I. du Pont de Nemours and Co., Inc.). U. S. 2,392,378, Jan. 8. Polymers are prepared by heating to polymerizing temperature a mixture of chlorotrifluoroethylene and an olefin hydrocarbon having not more than five carbon atoms in contact with a peroxy compound as a catalyst.

ELECTRICAL APPARATUS. R. M. Joyce, Jr. (to E. I. du Pont de Nemours and Co., Inc.). U. S. 2,392,388, Jan. 8. In the manufacture of electric motors the armature slots are insulated with polytetrafluoroethylene and wound with wire coated with the same resin and the assembly is then heated to 200 to 400° C. to anneal the winding.

DECOLORIZING PROCESS. R. M. Joyce, Jr. (to E. I. du Pont de Nemours and Co., Inc.). U. S. 2,392,389, Jan. 8. Polytetrafluoroethylene is decolorized by heating at 50 to 500° C. in an oxidizing atmosphere for at least one-half hour.

POLYMER. J. C. Patrick (to Thiokol Corp.). U. S. 2,392,402, Jan. 8. A polymer is prepared by reacting an organic compound containing two adjacent aliphatic carbon atoms to each of which is attached a substituent which is split off during the reaction with a mixture composed of an alkaline disulfide and an alkaline monosulfide.

CUTTING MECHANISM. J. Casalino (to J. H. Meyer Brothers). U. S. 2,392,459, Jan. 8. An apparatus for cutting plastic objects from a plastic element.

RESIN PRODUCTION. J. J. O'Neill (to Sinclair Refining Co.). U. S. 2,392,497, Jan. 8. Film-forming material is prepared of non-paraffinic hydrocarbons derived from solvent processing, with aqueous phenol solvent, of a petroleum oil.

ADHESIVES. C. F. Brown (to U. S. Rubber Co.). U. S. 2,392,574, Jan. 8. A composite article comprising a layer of a rubberlike material derived from a partially hydrolyzed polyvinyl ester, a layer of metal having a phenolic resin base coat, and an adhesive coating between the layers comprising partially hydrolyzed polyvinyl acetate, red iron, lead chromate, magnesium oxide and an in situ hardened phenol-aldehyde resin.

SHEET MATERIAL. A. G. Chenicek (to Pittsburgh Plate Glass Co.). U. S. 2,392,578, Jan. 8. Sheet material is formed from a transparent polymer of an ester containing two unsaturated radicals having unsaturation in an aliphatic carbon chain and having the double bond attached to the second carbon atom from a connecting oxygen atom, by polymerizing in contact with a smooth rigid mold to which the solid polymer adheres, continuing polymerization until a soft rigid gel containing an acetone-insoluble gel is formed, inducing uniform contraction by releasing the polymer from the mold and further polymerizing.

RESINS. M. T. Harvey (to Harvel Research Corp.). U. S. 2,392,589, Jan. 8. A composition comprising a normally solid material such as polyvinyl chloride, polyvinyl acetate, polyvinyl chloroacetate or polyvinyl butyral, and a normally liquid condensate of formaldehyde and a tertiary alkyl alcohol.

ADHESIVE. O. H. Smith (to U. S. Rubber Co.). U. S. 2,392,618, Jan. 8. Rubber is bonded to a metal surface by means of heat and pressure and an adhesive which includes rubber chloride in combination with a rubber derivative obtained by depolymerizing with heat in the presence of sulfur and a vulcanization accelerator.

POLYMERS. F. Strain (to Pittsburgh Plate Glass Co.). U. S. 2,392,621, Jan. 8. A polymerizable liquid is prepared by heating a mixture of a dialkyl ester of an alpha-beta dicarboxylic acid, and a glycol, and continuously removing the alkyl alcohol thus produced.

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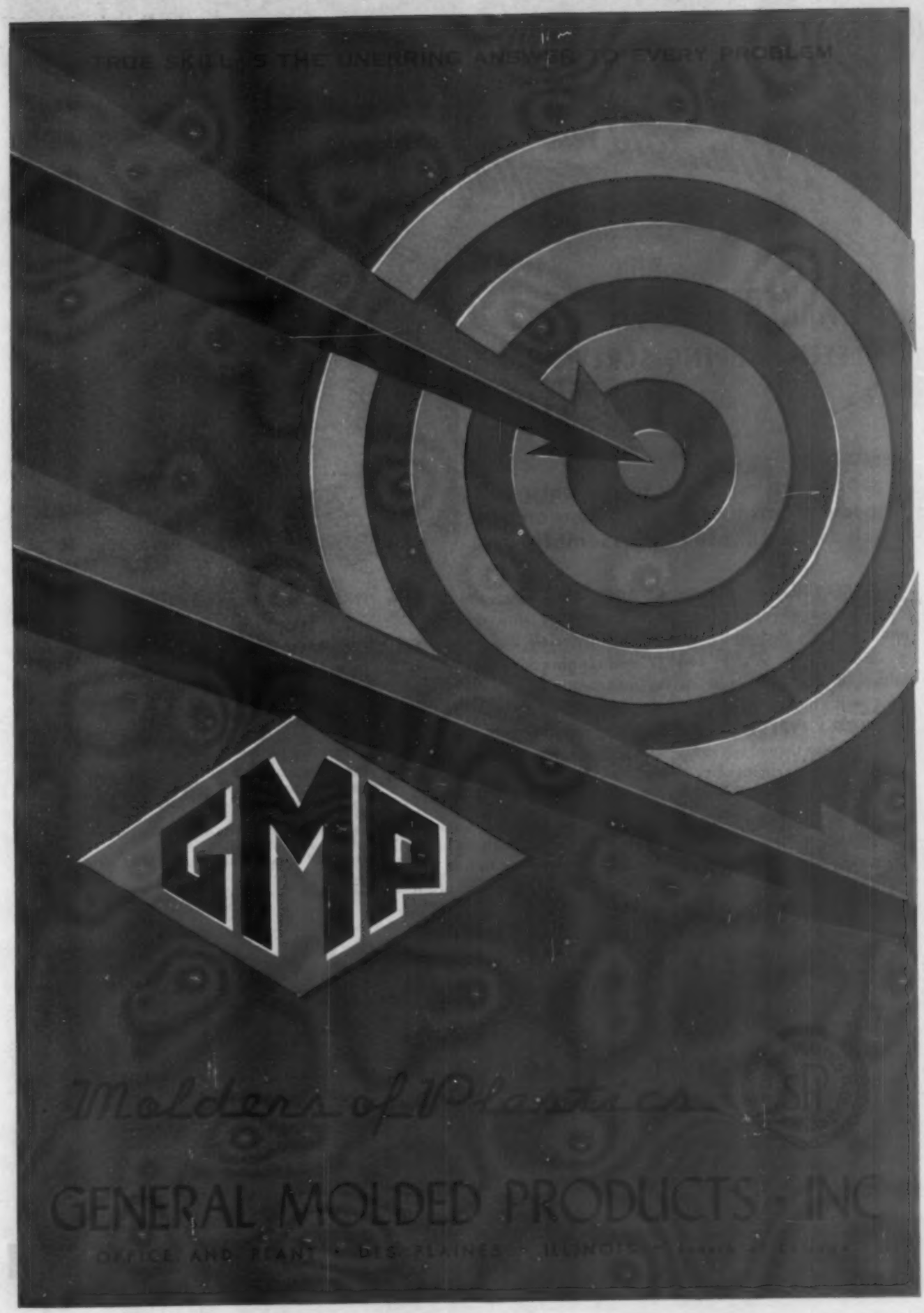
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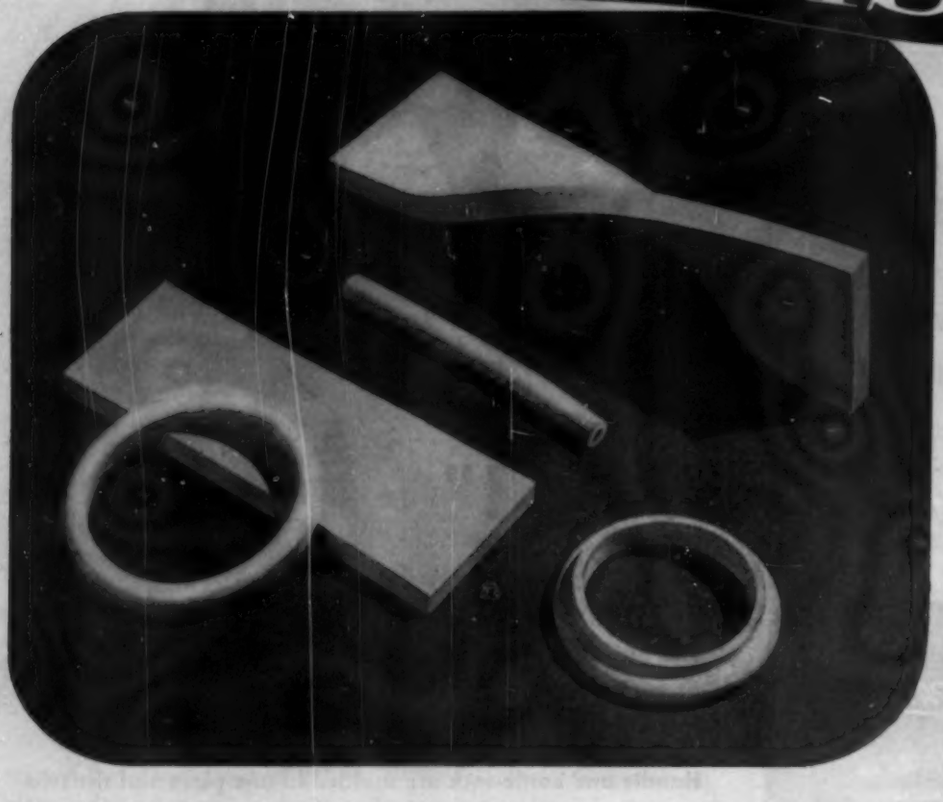

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Plastics Bulletin 23 (recently announced) has been withheld in order to include a vitally important addition to the Olsen line of Plastics Testing Equipment. If you have requested a copy and have not received it, we ask your forbearance. If not, write today to reserve your copy which will appear in the very near future.

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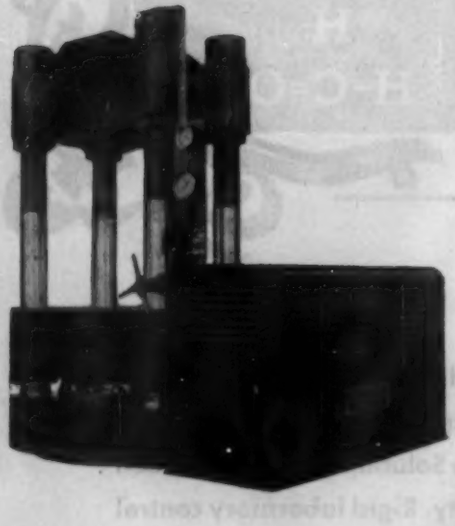

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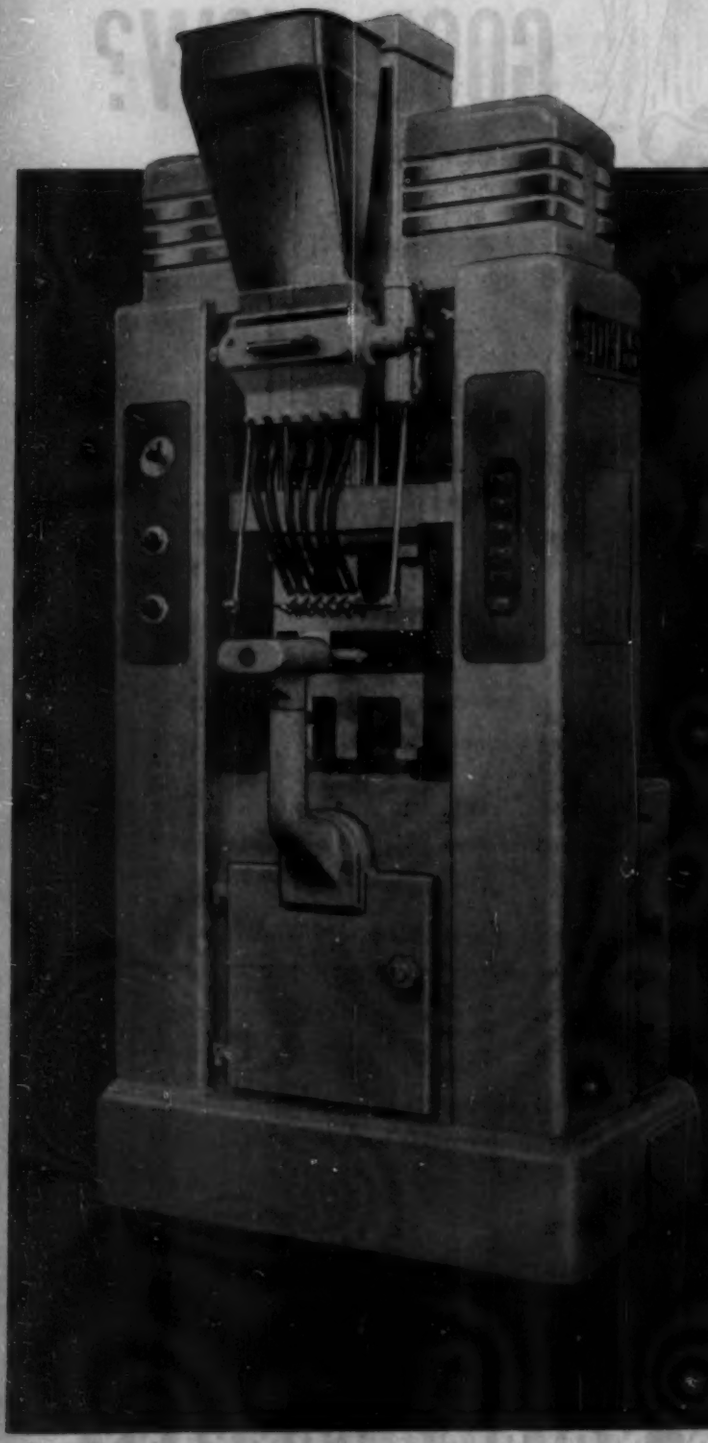

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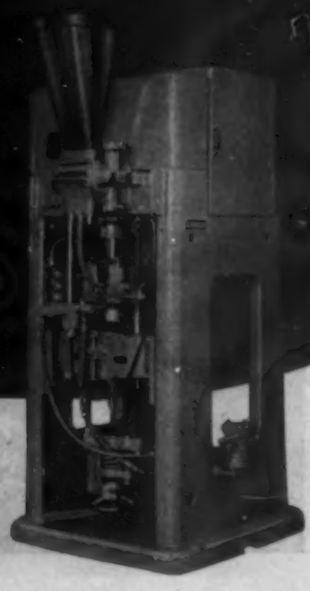

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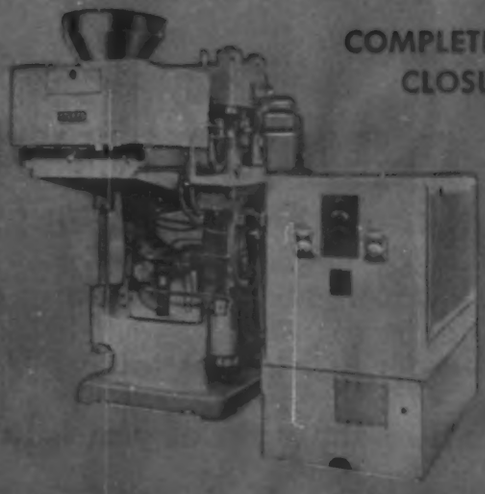

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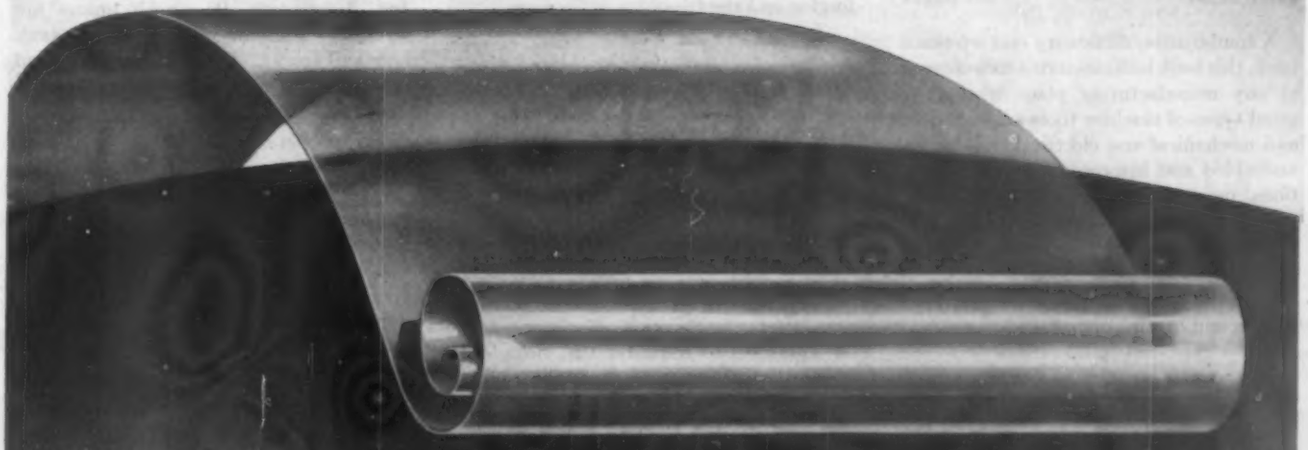

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Surface active agents, theoretical aspects and applications

by C. B. F. Young and K. N. Coons

Published by Chemical Publishing Co., Inc., 26 Court St., Dept. MJ, Brooklyn 2, N. Y., 1945

Price $6.00 **381 pages**

This book treats in detail the theoretical aspects of surface tension, its application to industrial fields, effects of surface-active agents, and the relation between surface tension and other physical properties of matter. Branches of industry in which surface-active agents are used are discussed.

Many illustrations, tabulated data, a carefully selected bibliography and chemical and mathematical equations add to the value of the volume.

Shop terms

Prepared by the Department of Education, International Business Machines Corp.

Published by Syracuse University Press, Syracuse, N. Y., 1945

Price $1.00 **106 pages**

A combination dictionary and reference book, this book includes terms encountered in any manufacturing plant where the usual types of machine tools are operated, and mechanical and electrical devices are assembled and inspected. Simple definitions, most of them clarified by illustrations, are especially helpful to new workers. A guide to pronunciation is given, as well as a complete set of tables for the calculation of feeds and speeds in milling and turning operations.

● Modern coatings based on resins are discussed in an attractive booklet prepared by Bakelite Corp., New York 17, N. Y., for manufacturer, engineer and product designer. Values of new properties obtainable in such coatings and the best methods of employing them are considered. Resins treated in the discussion are grouped in four general classifications: phenolic resins, C-9 resins, dispersion resins and polystyrene resins.

● A new instruction pamphlet covering a series of resorcinol-type resins has been made available by Synvar Corp., Wilmington 99, Del. These Synvaren resins are produced in four grades: PLS-AA, PLS-A, PLS-1 and PLS-2. According to the manufacturer, they can be cured at a room temperature of 70° F., at intermediate temperatures and at hot press temperatures. Uses for these resins include bonding of wood to other surfaces such as metal, glass, etc., as well as bonding of vulcanized fibre, hard rubber, laminated phenolic, cork, plaster of Paris, glass fiber.

● The neophyte in plastics will find the "Plastics Primer" published by Dow Chemical Co., Midland, Mich., much to his liking. The booklet, although nontechnical, makes no attempt to talk down to its readers while explaining the fundamentals of plastics and their production, the characteristics and uses of Styron, Ethocel, Saran and packaging materials.

● "The Hydraulic Press" No. 38 has been received from Hydraulic Press Mfg. Co., Mt. Gilead, Ohio. This attractive illustrated publication contains articles describing the press equipment used in the production of such parts as components for "jet" airplane engines, rawhide hammers and telephone equipment. Other articles describe closed die forging, flat die forging, upset forging, extrusion forging and the trimming of forgings.

● Plastics granulating machines, which can be used by the manufacturer of molding compounds or by the molder for reducing his scrap, are illustrated and described in a descriptive catalog issued by Cumberland Engineering Co., Providence, R. I. The four sizes shown are said to be extremely rugged, capable of extensive cutting by reason of a compactly designed cutting chamber, easy to clean and adjust.

● The Electric Indicator Co., Stamford, Conn., manufacturers of precision fractional horsepower motors and generators, has released the Elinco Catalog FB, describing in detail the company's Elinco FB permanent-magnet AC and DC generators, split-field DC motors, permanent-magnet DC motors, series and universal motors, shunt-wound DC motors.

● The "Specification Index," a postwar general catalog (No. W1800) on the company's line of automatic controlling, recording and indicating instruments has recently been published by the Bristol Co., Waterbury 91, Conn.

● Received from John Nooter Boiler Works Co., St. Louis 4, Mo., is the Fiftieth Anniversary Number of their house organ which tells the story of the company's development from a small boiler repair shop to a large steel and alloy plate fabricator, producing such equipment as condensers, heat exchangers, mixing and processing equipment.

● U. S. Plywood Corp. and Mengel Co., Louisville, Ky., have jointly issued a brochure on modern, practical applications of Weldwood plywood for commercial interiors. Illustrations of decorative plywood installations in stores, offices, banks, hotels show the material's versatility.

● Fiberglas cloths which are coated with vinyl and other synthetic resins, synthetic rubbers, etc., are described in a leaflet released by Owens-Corning Fiberglas Corp., Toledo 1, Ohio. Tipped-on samples of the material supplement the text.

● Industrial linings including vinyls, polystyrene, polyethylene, Bakelite, Velite, GR-S, GR-N, butyl rubber, Neoprene and Thiokol applied as film, sheet or trowelling linings are discussed in a folder released by Industrial Lining Engineers, Inc., Edgeworth, Pa. Such linings are essential for oil and water pipe lines, tank cars and trucks, electroplating tanks and racks, lacquer blending and pickling tanks.

● Six pocket-size pamphlets have been issued by Delta Manufacturing Co., Milwaukee 1, Wis., on the subjects of cut-off machines, quality drill presses, accurate low-cost tool grinding, Toolmaker grinders, metal-cutting band saws and abrasive finishing machines.

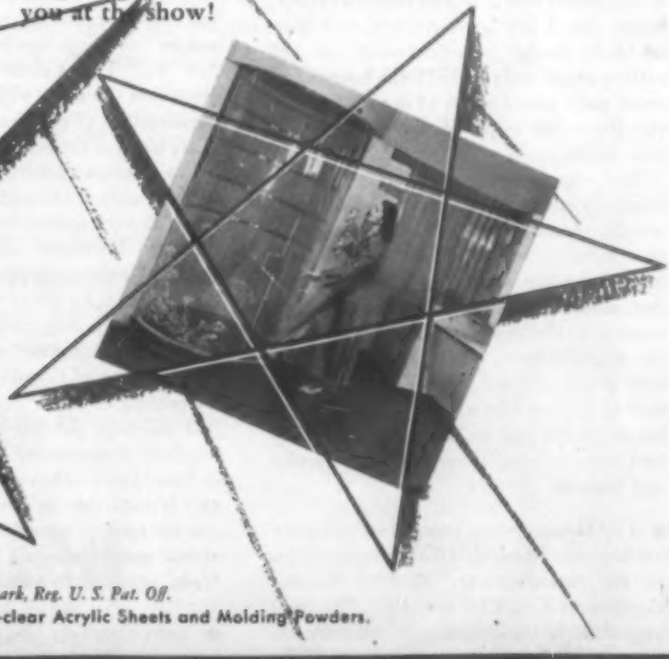
● A brochure published by Blaw-Knox Co., Pittsburgh 12, Pa., presents conclusions of prefabricated power piping engineers regarding the design of piping layouts for flexibility. Many details of standard and special types and sizes of functional spring hangers and vibration eliminators are given in the booklet, along with instructions for their installation and engineering information that will be helpful when this type of support is considered.

● National Automatic Tool Co., Inc., Richmond, Ind., has recently published "Drills and Drilling Practice," a spiral bound booklet selling for fifty cents. Aided by diagrams, the text presents instructions for working with the various types of metals and plastics, as well as rubber, fiber and wood. Terminology, drills and drill procedure are included.

Starring at the S.P.I. Show

Grand Central Palace — New York City
April 22 to 27 Inc.

THE PLEXIGLAS DREAM SUITE



If you haven't already seen the PLEXIGLAS "DREAM SUITE," here's your big chance to do so. For this beautiful, modern three-room suite is part of the S. P. I. show at New York's Grand Central Palace beginning April 22.

You'll see PLEXIGLAS applications that the public wants—and that you can plan to provide. Radiant walls, transparent enclosures and decorative accessories . . . a host of items fabricated from this war-famed plastic that has been admired by hundreds of thousands who've seen the Dream Suite at leading department stores.

By seeing the Dream Suite yourself, you'll get new ideas. By adapting these ideas to your own products, you'll profit through PLEXIGLAS. We'll be glad to offer technical assistance . . . and see you at the show!

PLEXIGLAS *is a trade-mark, Reg. U. S. Pat. Off.*
Only Rohm & Haas makes PLEXIGLAS Crystal-clear Acrylic Sheets and Molding Powders.

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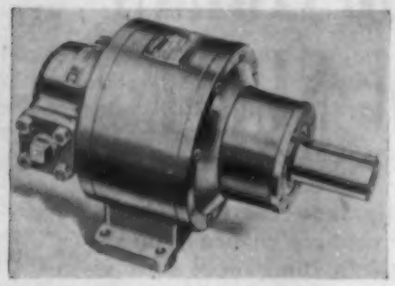
WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Manufacturers of Chemicals including Plastics . . . Synthetic Insecticides . . . Fungicides . . . Enzymes . . . Chemicals for the Leather, Textile, Enamelware, Rubber and other Industries

New Machinery and Equipment

● The Hydraulic Machinery, Incorporated, of Dearborn, Michigan, has recently announced a "Superdraulic Pump." This radial type plunger unit will deliver up to 17 gal. per min. and 5000 p.s.i., using a 40-



hp. motor turning at 1200 r.p.m. It is supplied in two models, 1) for constant delivery and 2) for variable delivery. The performance curve shows a volumetric efficiency of approximately 85 percent at maximum output.

● Two new drill press attachments which are designed to fit in the chuck of any standard make of drill press have been introduced by Barron Tool Co., Detroit, Mich. They are a rotary surface sander and planer. The wood planer is produced in aluminum and it can be used to rabbet, tenon, panel, bead, groove and rout with no blade change or adjustment. It will surface plane and parallel large boards and small work pieces up to 14 in. in width, or two times the width of the throat of the drill press.

The rotary surface sander is used for accurate and smooth surface sanding of woods, plastics and for the finishing of flat metallic surfaces. It comprises a hardened $^1/_2$-in. steel arbor inserted into a cast aluminum head. Cup-shaped aluminum oxide cloth sanding disks, supplied by the manufacturer, can be quickly slipped into place and are retained on the side wall of the head by a spring steel ring and latch. A felt pad on the under side of the tool does away with harsh abrasive action and burning.

● The Haug system power factor regulator has many desirable features, according to its manufacturer, Modern Control Equipment Co., Chicago, Ill. The most important of these is that it will raise the power factor by taking the magnetizing current off the line thus insuring the more efficient operation of the apparatus to which it is connected and a saving in man-hours. The unit is supplied with capacitors with individual fuzes in a rack with the necessary control equipment, and is available for three-phase and two-phase service. The regulator is equipped with both indoor and outdoor racks, and the ventilating ducts are designed to provide good air circulation.

● A new and simplified duplicating attachment for machine tools was introduced recently by Bailey Meter Co., Cleveland, Ohio. It is a combined air and hydraulic system which can be attached to engine and turret lathes or vertical boring mills to produce work pieces which correspond in contours to a thin metal templet or master part. Instead of the former method of applying power cylinders to both longitudinal and cross feeds for automatic operation, a single hydraulic power cylinder is applied to the lathe compound, which is usually set at 45° to the longitudinal axis of the work, and which produces practically the same net results. In addition to performing the typical work of a duplicating attachment, it is suited for turning, boring or facing and may also be applied to either large or small-sized machine tools.

● The Deublin Union has been announced by Deublin Co., Northbrook, Ill. This is a new type of rotating water joint for cooling revolving shafts, cylinders or drums and for handling liquids for heating up to 200° F. The Union utilizes a helical groove on the rotor which runs counter to the direction of rotation. This helix prevents leakage between the shaft and housing and keeps these two surfaces free of foreign matter through its sweeping action. Rotor concentricity is held to 0.001 in. total indicator reading, and is machined of stainless steel which increases tensile strength by three times that of cast shafts. The housing is of bronze, and both rotor and housing are resistant to the corrosive action of liquids that may be used for cooling or heating. *Lubricated-for-life* ball bearings provide almost frictionless freedom of movement. The unit is made in two styles—Monoflow and Duoflow—and is available in 4 standard sizes, but can be custom-manufactured to an individual manufacturer's requirements from $^1/_8$-in. pipe size to 6 inches.

● Auto Engraver Co., New York, N. Y., has redesigned its auto engraver for civilian use. It is adaptable to drilling multiple series of holes by using a master plate, it profiles small parts, engraves on round or flat surfaces and cuts smooth lines; accuracy and increased production are achieved due to the fact that both article and type are visible at all times; the specially constructed copy holder permits almost any type of set-up, and progress may be checked accurately by rotating the stylus arm without disturbing the work. Model D3, which is but one of several available models, is 21 by 20 by 13 in. and weighs 40 lb., with a fixed ratio of 1:1.

● Colonial Broach Co., Detroit 13, Mich., has provided for increased flexibility in its Junior hydraulic broaching and assembly presses through additional equipment which enables the press to be used interchangeably for straightening operations. This changeover to straightening

work is accomplished by placing a self-contained single-unit roller-type straightening fixture on the platen of the machine. The fixture extends out beyond the platen to left and right in order to provide ample support for work pieces which are considerably longer than the width of the standard machine platen. These presses are available in both base type model (illustrated) and bench type model.

(*Please turn to next page*)

Meet "Samson Jr."

. . . MINIATURE STRONGMAN!

Its splendid physique and brawn are the result of training plastic formulations to meet industry's toughest specifications!

"Samson Jr." is a Toggle Lever. Consolidated compression molds this part *fourteen* at a time . . . complete as you see it here!

The enlarged Xray reveals the muscles feature — a strip of resin-impregnated Roger Board — fused under heat and pressure simultaneously with the elongated phenolic preform. The *brawn* is thus molded in place together with the metal (actuating mechanism) insert.

The part, as the illustration indicates, rotates on plastic shafts . . . this motion activates the shoulders, or trunions. Constant operating requirements demand strength — endurance plus — dependability!

We've a *soft* spot for this *toughy* . . . and knowing the full satisfaction of having done the job well, we point with professional pride to the time and care given to the mold design . . . its construction . . . and the "14 times the many thousands" of "Samson Jrs." it has already placed at industry's service!

Should you now be planning or projecting an item or part requiring *broad shoulders* or *backbone*, call Consolidated . . . We've the know-how that modern plastics production demands. Inquiries invited.

CMP "YOUR BLUEPRINT IN PLASTIC"

Consolidated

MOLDED PRODUCTS *Corporation*

309 CHERRY STREET, SCRANTON 2, PA.

transfer molding

injection molding

compression molding

Branches: NEW YORK · CHICAGO · DETROIT · BRIDGEPORT · CLEVELAND

● This vari-speed lathe, according to its producer, Precise Products Co., Racine, Wis., is an entirely new development in the tool field. It increases accuracy and speed in grinding, finishing and polishing of machine parts and small articles of steel, plastics, glass and wood. The lathe has built-in speed control with a range of 0 to 40,000 r.p.m. and is powered by the Precise-35 electric grinder and hand tool. This power unit can be detached and used separately as a hand tool for various finishing operations. The lathe stand is of solid cast aluminum and provides two recessed compartments for storing rotary tools, and is also equipped with safety glass shield.

● Time-O-Lite Model P-49 is a new feature of Industrial Timer Corp., Newark 5, N. J. The new model provides a simple accurate automatic means of controlling time of exposure on photographic and other apparatus where split-second time gaging and precision is absolutely essential. It is equipped with an additional receptacle to be attached to a printer platen switch for setting it in operation at whatever time interval was previously selected. The improved double scale on the dial has large clear divisions and numbers for easy reading.

● A new line of carbide-tipped milling cutters and end mills has been announced by Nelco Tool Co., Inc., Brooklyn 31, N. Y. This new design of tool includes 2- and 4-flute carbide end mills from 1/4 in. diameter up to 2 in., large end mills up to 5 in. in diameter with No. 50 NMTB shanks, shell end mills, face mills, slotting cutters and half side mills up to 8 in. in diameter. The cutter bodies are made of a special alloy casting having high strength and are designed on the heavy side so as to create a flywheel action. Extremely heavy carbide tips are used to withstand shock, improve tool life and permit numerous regrinds before new tips must be brazed in. A special brazing method increases the number of pieces machined per grind by at least 70 percent while at the same time decreasing the possibility of tip breakage. The tools are designed for mounting on standard No. 50 NMTB spindles or standard milling cutter arbors. No special adapters are needed for mounting the tools.

● Hardinge Brothers, Inc., Elmira, N. Y., has added two new collet holding fixtures to its line of collet index fixtures. These fixtures can be used either horizontally or vertically for special drilling, milling, grinding or broaching set-ups, and are designed to meet the need for lower cost fixtures for production work where indexing is not required. They take standard 5C Hardinge collets, thus providing interchangeability with the collet index fixtures and precision second operation machines. The HV-H fixture has an overall height of 5 inches. The HV-HN fixture, which is equipped with threaded nose spindle, is 6 1/8 inches in overall dimension.

● Handle-Grip is the newest member of Pneumatics, Inc., Plymouth, Indiana, line of 1/2-in., 4-way controls. It contains a detention spring which permits it to be fixed in either position. This valve is slightly over 5 in. tall, 4 in. deep and 3 in. wide and is very compact, according to the manufacturer.

● A type A-4 machine for the Brinnel testing of heavy and hard-to-handle specimens has been announced by Steel City Testing Laboratory, Detroit 4, Mich. The hardened steel plate on the base of this unit, which can be set up in any position to suit the test requirements, provides proper foundation for testing. The cross head motor is controlled with a reversible switch; pressure upon the head is hydraulically operated. The machine comes equipped with either a standard Brinnel microscope for reading diameter of impression, or with a direct reading attachment. It is available in two sizes: the first, 3 ft. 8 in. between standards, is designed for testing specimens 51 in. (max.) in height; the second, 22 in. between standards, is for specimens 24 in. (max.) in height.

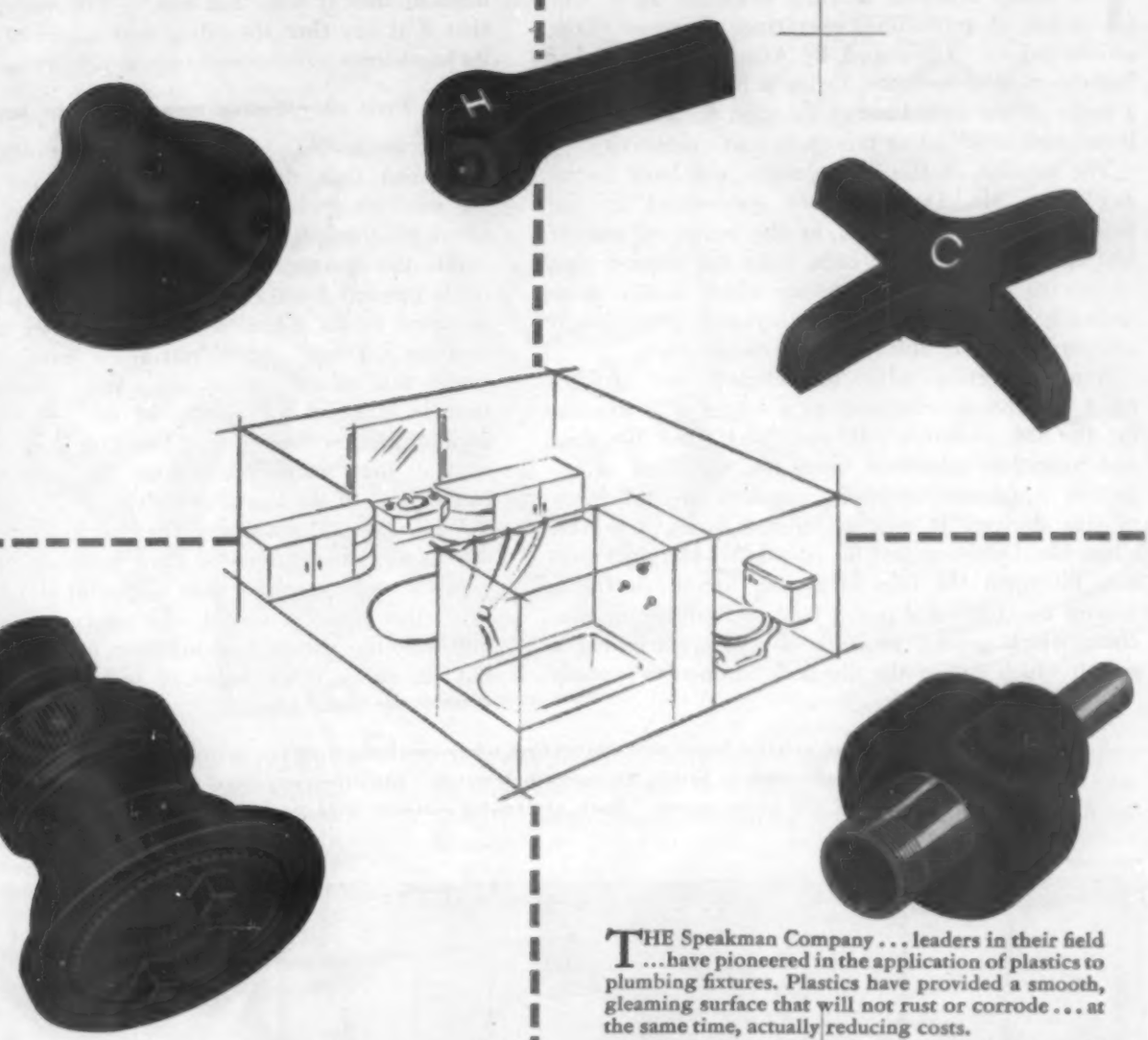
● A portable plastic coating melting tank of one gallon capacity is a new product of Aeroil Products Co., W. New York, N. J. An important feature of this model is that full compound load can be brought to dipping temperature from a cold start in minutes instead of the hours normally required, thereby eliminating heat-up time delays. The Midget-6 has a one-piece inner vat of heavy warp-proof cast-aluminum of high heat conductivity. Several features of this tank are: thermostatic controls which maintain required temperature, removable cover with insulated plastic knob handle, and neon pilot light for swift visual check. It has an operating range of from 125 to 500° F., capacity of heating elements is 1000 watts, current required on 110-V line is 9 amperes. Approximate weight of this Midget-6 tank is 16 1/2 pounds.

● Bradford Machine Tool Co., Cincinnati, Ohio, has added a complete line of metal master electrical tools to its production of master lathes. This line will include lathe grinders, automotive equipment, disk sanders, adjustable speed snagging grinders, adjustable speed polishers and nut runners.

● A new speed control valve, recently developed by Ross Operating Valve Co., Detroit 10, Mich., is designed to give split-second control of piston speed by providing an unlimited range of selectivity in the volume of air flowing from cylinder to operating valve. Small or large air volume is said to be regulated with absolute precision taking place in smooth progression rather than in a series of steps. There are two moving parts to this valve—the stem which is shaped to form a venturi for air passage in small volume, and the poppet. As the threaded stem is turned downward from a closed position, incoming air in small volume passes through the venturi into the outlet passage, increasing in volume as the stem is lowered. Continued turning of the stem causes a flange to open the poppet, permitting increase in volume to full flow. Return air coming into the valve is at full flow.

● United Precision Products Co., Chicago 18, Ill., has produced a complete gage set which is supplied in a cabinet for convenience by gage users who must have a wide range of units within immediate reach. Cabinet No. 500 has a range of gages from 0.030 to 0.500 in. in increments of 0.001. Cabinet No. 600 contains 501 members from 0.500 to 1.000 in. in increments of 0.001. Plastic collets are included for each member in both cabinets. Gaging members are available in XX, X, Y, Z and ZZ tolerances.

PLAN TO USE PLASTICS



Alert product designers are aware of the trend toward plastics. Aggressive manufacturers recognize their sales appeal. They know users like their smooth, satiny feel ... that their crisp colors sell where logic often fails.

THE Speakman Company ... leaders in their field ... have pioneered in the application of plastics to plumbing fixtures. Plastics have provided a smooth, gleaming surface that will not rust or corrode ... at the same time, actually reducing costs.

Production was simplified ... blueprints kept in one place and correspondence limited to one source ... by placing the order for the complete line in the hands of *one molder* ... *Aico*. Because Aico uses all molding methods and materials, Speakman knew that Aico would decide, without bias, the one method and material best suited for each individual part.

The addition of color ... a smoother finish ... a lower cost may be the sales secret of your product.

Drop us a line on your letterhead ... we will forward your copy of "Aico Plastics from Your Point of View." It will help you *plan to use plastics.*

Aico

PRECISION MOLDING

AMERICAN INSULATOR CORPORATION

NEW FREEDOM, PA.

SALES OFFICES: Boston • Bridgeport • Cleveland Detroit • New York • Philadelphia

A foolproof safety switch

A MAGNETIC field set-up just in front of the jaws of heavy injection molding machines is a new means of protecting operating personnel from serious injury. Developed by Allan R. Davidson of Reliable Radio, Inc., the device is being tried out on a press at the Erie Plastics Co. and further work is being done in adjusting the equipment's sensitivity.

The creation of this safety unit dates back to the day when Mr. Davidson was approached by the Erie Plastics management, in the course of one of his regular maintenance calls, with the request that he try to develop some device which would automatically open the jaws of an injection press should an operator's body obtrude on the danger zone.

Experimentation with the electric eye quickly ruled out this development as a source of activation for the safety switch. It was found that the dust and vibration attendant upon the operation of injection equipment seriously impaired the efficiency of this device. It was a different story, however, when Mr. Davidson and his co-worker, Harold Peterson, hit upon the idea of setting up an electronic control by creating a power field in front of the machine which cannot be entered without tripping a switch which causes the die jaws to open or remain open. It was found that this equipment can even be built so that it will "fail safe." The set-up is such that if at any time the safety unit ceases to function, its breakdown automatically opens the jaws.

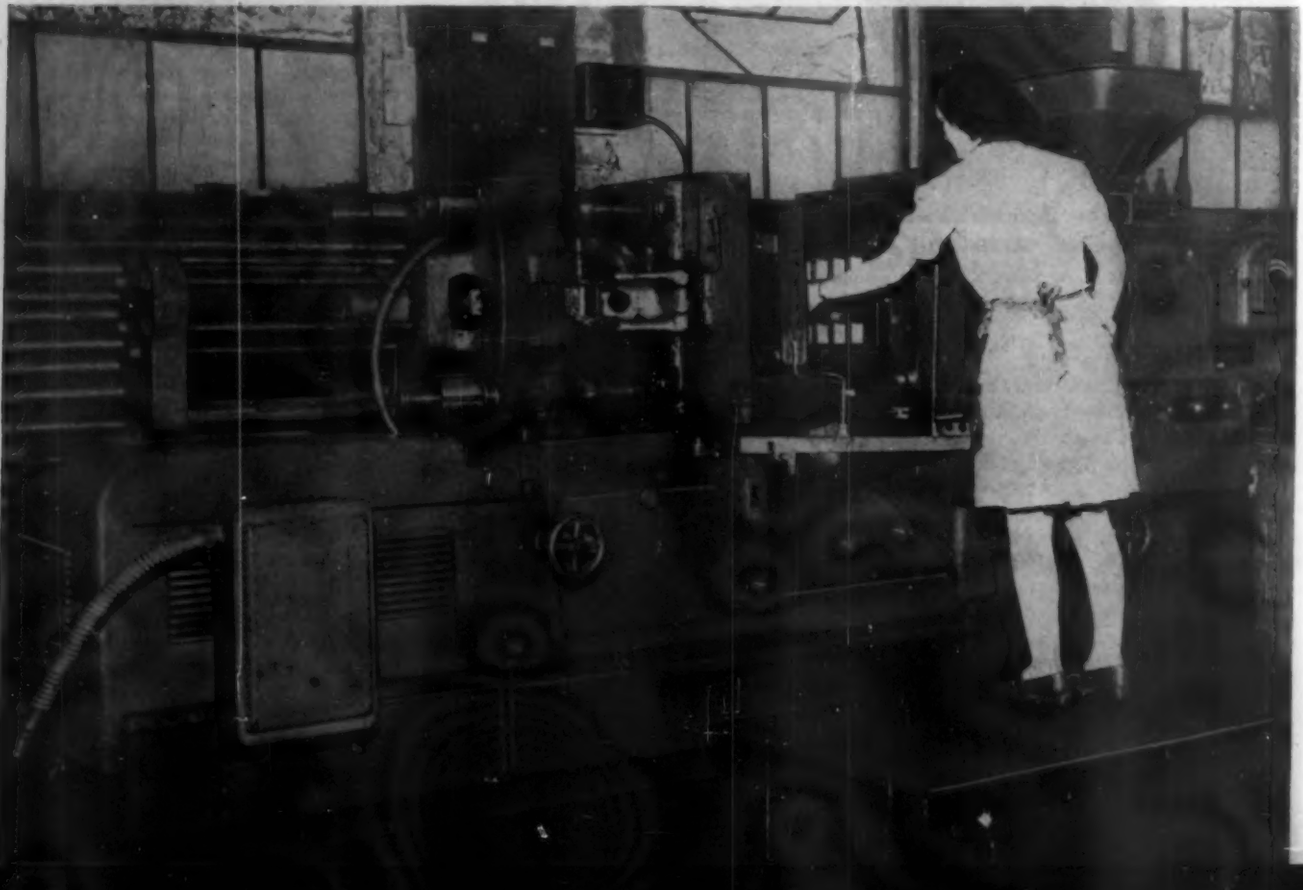
Two electrodes are heart of unit

Flat electrodes, several inches in width, are so positioned that they extend between the jaws of the machine when it is in the open position. In the above photograph, the left electrode can be seen just beside the operator's wrist. The other electrode extends upward from a control box set on a steel bar anchored to the injection machine slightly above the operator's knees. Wires run from these two electrodes to a second control box which, in our illustration, is attached to the wall at the left side of the middle window casement. The arrangement of the controls may vary slightly from this original set-up in the plant of the Erie Plastics Co.

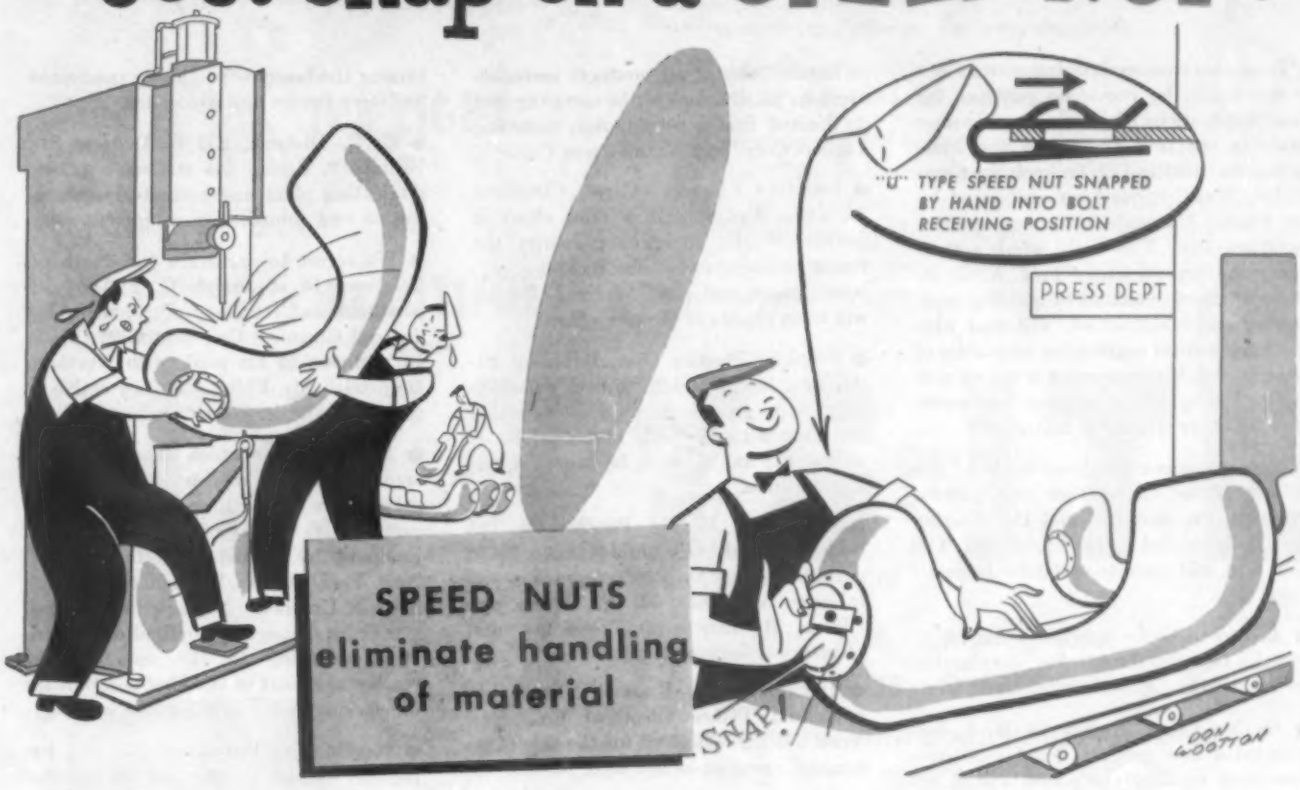
While the performance of the unit has proved most satisfactory, the equipment has a tendency to become over- or under-sensitive over a span of about a week. With this problem solved, the safety switch should find wide use not only on injection molding machines but on many other types of industrial equipment.

Two flat electrodes, two control boxes and connecting wires comprise a safety switch for injection molding equipment. One electrode is beside the operator's wrist; the other attached to a control box and positioned in front of the girl's knees. Both electrodes connect with control box at middle window

PHOTO, COURTESY ERIE PLASTICS CO.



Why do it the hard way ?
Just snap on a SPEED NUT !


"U" TYPE SPEED NUT SNAPPED BY HAND INTO BOLT RECEIVING POSITION
PRESS DEPT
SPEED NUTS eliminate handling of material
SNAP!
DON WOOTTON

A SPEED NUT CASE HISTORY

One car builder used four welding machines to attach cage nuts on fender stampings for head lamp assembly. Three men were needed for each machine . . . one hauled stampings from the press department and two more wrestled the stampings and located them in fixtures on the welder. Because of all this handling, stampings were frequently damaged. And after painting, threads had to be re-tapped.

Changing to self-retaining Speed Nuts radically reduced the costs of this operation! Two men now do this work on a conveyor and quickly snap the Speed Nuts into place by hand. We will be glad to give you complete details of this case history on request.

* * *

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London
In France: Aerocessoires Simmonds, S.A., Paris
In Australia: Simmonds Aerocessories, Pty. Ltd., Melbourne

Time was when the only way to fasten a nut in place for blind location assembly was to weld, rivet or clinch a cage nut over the bolt hole. This anchored the nut . . . but man, what a job it was!

Changing to Speed Nuts really simplifies this type of operation! Effort is reduced to a fraction — hands freed for more productive work. Welding machines eliminated. Less floor space needed. And, there is less handling and easier final assembly. You get all this *plus* a better finished product because the spring tension lock of Tinnerman Speed Nuts *prevents vibration loosening.*

There are many types of self-retaining Speed Nuts . . . all designed to drastically reduce the cost of blind location fastening. Let us show you how they can be used on your product to effect really worth-while savings. Send in your assembly details today!

TINNERMAN PRODUCTS, INC.
2048 FULTON ROAD • CLEVELAND 13, OHIO

Speed Nuts*
PATENTED
MORE THAN 3000 SHAPES AND SIZES

* Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS

News of the Industry

● Long-range research to improve service to the public by providing guidance for wiser applications of plastics in consumer products has been started at the Massachusetts Institute of Technology, Cambridge, Mass., it has been announced by the Plastic Materials Manufacturers Association, Inc. The work, which will be under the supervision of Prof. A. G. H. Dietz of the department of building engineering and construction, will deal with the fundamental engineering properties of plastics and, if necessary, will set up new test methods, similar to those now available for other structural materials.

● Announcement has been made of the merger of the Globe Tool and Molded Products Co. and Imperial Die Casting Co., both located in Rockford, Ill. The new firm will operate as Globe Imperial Corp.

● According to an announcement, Abar Plastics Co., Pittsburgh, Pa., is enlarging its injection and extrusion departments.

● Gaybex Corp., Nutley 10, N. J., has released a new product Bex UT-30 concentrated washing compound which, according to the announcement, is "an amber liquid, which, extended with 10 to 500 parts of water, will safely and thoroughly clean any surface to which water may be applied."

● Carbide and Carbon Chemicals Corp., New York 17, N. Y., has announced that Flexol plasticizer TOF (trioctyl phosphate) a new plasticizer, is now available in limited quantities, with tank-car quantities promised for later this year when a plant now under construction has been completed.

● Impression Molding, Inc., North Wilbraham, Mass., has recently been formed to produce proprietory molded and laminated plastics products employing low pressure techniques. Michael A. Brown, Jr., formerly with Monsanto Chemical Co., will head the new corporation.

● Formica Insulation Co., Cincinnati 32, Ohio, has opened a direct factory branch office in Philadelphia with Albert Lesberil as branch manager.

● Accurate Molding Co., Brooklyn, N. Y., will move this month to larger quarters in Long Island City, N. Y.

● Announcement has been made of the formation of the St. Regis Sales Corp. as a wholly owned subsidiary of the St. Regis Paper Co., New York 17, N. Y., to handle sales of all products manufactured by all divisions of the company and its United States subsidiaries, including Taggert Corp. and Watab Paper Co.

● Interlake Chemical Corp., Cleveland 14, Ohio, has opened a sales office in Seattle, Wash., to serve primarily the forest products' industries, including plywood, paper and pulp. John J. Bogner will be in charge of the new office.

● Franklin Plastics Div., Robinson Industries, Inc., Franklin, Pa., is enlarging its plant to provide room for new injection machines with assembly and finishing as well as the tool room to be housed in the new addition.

● Cambridge Molded Plastics Co. has been organized in Cambridge, Ohio, to do custom molding by both compression and injection methods. Eli F. Jensen and Clifton R. Downs are president and secretary-treasurer, respectively.

● Inorganics, Inc., Knoxville, Tenn., has appointed Fisher Chemical Co., New York, N. Y., sole agent for the sale of its benzoyl peroxide in the U. S. A.

● Arnkurt Associate Engineers have been established with offices at 82 Beaver St., New York 5, N. Y., to serve as plastics consultants and product designers.

● Plans for the construction of a new $1,000,000 unit for production of the pyroxylin type of nitrocellulose at the Carney's Point, N. J., plant of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., have recently been announced.

● Omega Plastics Corp., Chicago, Ill., has been organized to design, develop and manufacture a variety of plastics products with emphasis on automotive field applications. Production is to start by June 15.

● Glass Fibers, Inc., Maumee, Ohio, has been organized by Randolph H. Bernard, former director and executive vice-president, Owens-Illinois Glass Co., Toledo, Ohio, to manufacture staple glass fiber products and glass wool.

● The entire Saran Div. of Hodgman Rubber Co. has been acquired by American Hard Rubber Co., New York 13, N. Y., in the furtherance of its plans to broaden its field of plastics manufacture. This expansion will include not only Saran but Tenite, Lucite, polystyrene and other thermoplastics.

● Broder Industries, Inc., 161–167 W. 64th St., New York 23, N. Y., is continuing the business previously conducted by Harry Broder and Associates.

● C. C. Dietrick, 233 S. Dellrose St., Wichita 8, Kans., has started a plastic fabricating plant and plans to install injection and compression equipment soon.

● We regret to announce the death on February 16 of Joseph C. Fuller, vice president and secretary of Northern Industrial Chemical Co., Boston 27, Mass. In addition to his work with Northern Industrial, Mr. Fuller was very active in the Society of the Plastics Industry.

● A special finish which when applied to spun rayons and mixtures of rayon and other fibers is said to make these fabrics permanently crease-resistant has been produced by United Piece Dye Works, New York 16, N. Y., under the trade name of Unidure. Not a surface process, this finish through its method of application, according to the manufacturer, reaches the heart of the fiber and remains impervious to dry cleaning and washing.

● Neville Co., Pittsburgh 25, Pa., has recently placed on the market Nevillac TS, a plasticizing resin which is compatible with zein, cellulose derivatives, terpene, alkyd, phenolic, vinyl, coumarone-indene resins and synthetic rubber. According to the release the resin has little odor, good color retention and is very viscose and slow flowing. Suggested uses for the product are as a plasticizer, softener, impregnant and for water and greaseproof paper coatings.

● Duorite Plastic Industries, Culver City, Calif., has developed a new synthetic resin which is designed to strengthen inexpensive plaster casts and to strengthen and beautify such porous materials as cardboard. Called Plastiglaze, it is an air-setting material produced by combining various thermoplastic and thermosetting resins in the presence of any one of several solvents.

● The M. A. Hanna Co., Cleveland, Ohio, has opened a new department which will include among its activities the development and use of coal-derived hydrocarbons by chemical, plastics and other industries.

● Amecco Chemicals, Inc., New York 17, N. Y., manufacturers of synthetic chemicals, has announced that it has sold its Rochester, N. Y., plant and is transferring manufacturing operations previously carried out at this plant to Dover, Ohio, and

it's STRONG

it's LIGHT

it's BEAUTIFUL

For their new high chair, the WEAR-EVER and RAMSDELL Companies wanted a very special tray. It had to have:

— unusual *strength*, so it wouldn't splinter, dent or mar like old-fashioned materials.

— exceptional *lightness* for easy handling.

— lasting *beauty*; easy to clean, impervious to food and mild acid stains.

Difficult requirements for ordinary materials to fill, yes. But easy for KYS-ITE—because it offers a combination of properties no other type of material possesses. A combination which gives WEAR-EVER and RAMSDELL High Chairs unique sales appeal wherever sold — the plus quality that makes KYS-ITE a greater favorite every day.

it's KYS-ITE

Reg. U. S. Pat. Off.

WHY THE DEMAND FOR KYS-ITE IS SO STRONG

GREAT STRENGTH WITH LIGHT WEIGHT—Preformed before curing; impact strength up to 5 times that of ordinary plastics.

UNUSUAL ADAPTABILITY—lends itself to large hollow pieces, complicated pieces with projections or depressions, large or small shapes with thin wall sections.

INTEGRAL COLOR AND FINISH—highly durable, unusually resistant to abrasion, impervious to mild alkali and acid solutions.

NON-CONDUCTOR—KYS-ITE's dielectric properties are important where safety is a factor. It is also a poor conductor of heat and cold. Non-resonant, non-reverberating.

There have been so many orders for KYS-ITE that we cannot undertake additional specialty work at this time. We look for this situation to change as manpower and materials become more plentiful; when ready for new business we'll surely let you know.

KEYES FIBRE COMPANY
420 Lexington Avenue
New York 17, New York
Plant at Waterville, Maine

KEYES
MOLDED PRODUCTS

Preformed Plastic Combining Long- **KYS-ITE** **Fibred Wood Pulp and Synthetic Resin**

Reg. U. S. Pat. Off.

Henderson, Nev., where facilities will be greatly expanded.

● Engineering Associates, St. Charles Ill., has developed a treatment to produce from plasters such as plaster of Paris a versatile new product of great hardness and strength, in any color and at a low cost. The new product is said to be adaptable to many uses where plaster is unsuitable. It can also be adhered securely to other plastic materials such as acrylic, phenolic and cellulose acetate.

● Plant expansions announced by Columbia Protektosite Co., Inc., Carlstadt, N. J., include the moving of the New York Eye Shield Div. (henceforth plant No. 2) to a new factory at 1 Poplar St., E. Rutherford, N. J.; an addition to the main plant; and a proposed factory to have 150,000 sq. ft. floor space.

● A new coating resin, Duraplex ND-77B, claimed to produce metal finishes with unusual color and color retention, maximum gloss coupled with greater durability and resistance to alkalies and fruit acids has been announced by Resinous Products & Chemical Co., Inc., Philadelphia 5, Pa. This resin is a non-drying, phthalic alkyd designed for use in conjunction with Uformite, urea-formaldehyde resins or nitrocellulose to produce fast baking finishes under heat.

● The executive offices of Columbia Chemical Div., Pittsburgh Plate Glass Co., are now located on Fifth Ave. at Bellefield, Pittsburgh 13, Pa.

● General Industries, Inc., Elyria, Ohio, is building an addition to its plant to accommodate new injection machines.

● Columbus Plastics Co., Columbus, Ohio, has begun construction of a new modern molding plant and offices.

● Lindberg Tool and Engineering Co., Chicago, Ill., has changed its name to Moldall Plastics, in keeping with present production of plastic items by injection, transfer and compression molding.

● U. S. Plywood Corp., New York 18, N. Y., has inaugurated a new promotion and sales campaign for national distribution of Firzite, a wood sealer and softwood hardener composed of a synthetic resin and oil and especially prepared for use on fir plywood and other woods having pronounced alternate hard and soft growths. Its use is said to prevent face checking, to lay the "wild" grain, to provide an even foundation that helps keep the grain from showing through coats of enamel or paint.

● A new $200,000 corporation to be known as Chemical Coating Corp. has been formed to manufacture and sell specialized industrial coatings, lacquers and technical finishes. Under the presidency of Edward H. Christ, the company will operate from general offices in New Britain, Conn.

Personnel changes

● NAT REYBURN, formerly in the testing laboratory of American Cyanamid Co., New York 20, N. Y., has joined Keystone Brass Works, Inc., Erie, Pa., as chief engineer of the Applied Plastics Division.

● CLINTON RECTOR, at one time with WPB, has resigned from his position with Catalin Corp., New York 16, N. Y.

● New executive vice-president of Continental Can Co., Inc., New York 17, N. Y., is HANS A. EGGERS. KEN BROMLEY, formerly chief engineer, has been made superintendent of the Plastics Div., at Cambridge, Ohio.

● Hercules Powder Co., Wilmington, Del., has announced the appointment of FRANK G. OSWALD as assistant sales director of the Synthetics Department.

● FRANK H. SMART, formerly of the Plastics Div., E. I. du Pont de Nemours & Co., Inc., Wilmington 98, Del., has joined the sales staff of Whittaker, Clark & Daniels, Inc., New York, N. Y., and will specialize in the plastics field.

● Announcement has been made of the appointment of SAMUEL H. THOMAS as New York district sales manager of the chemical department of General Electric Co., Pittsfield, Mass.

● Plastic Manufacturers, Inc., Stamford, Conn., has announced the following appointments: JOHN R. CRELLIN, Jr., chief engineer; ROBERT B. BATTERSBY, sales engineer; RALPH R. BROWNING, JR., manager of Order Department; and ERNEST J. JOHNSON succeeding Walter H. Mende as comptroller. MYRON A. WICK, JR., has returned to the company as vice-president after serving for several years in the armed forces.

● HERBERT S. WERNER has resumed his duties as vice-president of R. D. Werner Co., New York 10, N. Y., and vice-president of Ardee Plastics Co., Inc., New York 10, N. Y.

● Two appointments have been made by Chemical Products Div. of Goodyear Tire and Rubber Co. They are: R. T. HICKCOX, formerly of the Research Dept. at Akron, now with plastics and coatings sales at Los Angeles, and A. E. GRUNDY with Pliofilm packaging sales dept. in Los Angeles.

● Recent appointments in the Calco Chemical Div., American Cyanamid Co., New York 20, N. Y., include J. H. McMURRAY as assistant manager of the division and AMES B. HETTRICK as assistant manager of the Pigment Department.

● HAROLD R. ALLEY is the new director of research for Arvey Corp., Chicago, Ill.

● ALFRED F. GAURON has been made field engineer for Advance Pressure Castings, Inc., Brooklyn 22, N. Y., manufacturers of die castings, for the New England District with offices at Amesbury, Mass.

● RICHARD S. HIRSCHLAND succeeds Guy Steeves as president of Geo. V. Clark Co., transparent acetate containers, lithographed cans and metal stampings. In the same release, this company also announced its removal to larger quarters in Astoria, N. Y.

● Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio, has announced new sales department appointments to facilitate sales and service work on molding compounds, resin glues and industrial resins: L. CHOYCE, manager, advertising dept. in Toledo; E. P. BOTSFORD, New York office manager; H. W. DEVORE, district manager and J. FERGUSON, service engineer, Chicago; H. L. HATCH, J. S. LAUBER and H. A. RAYMOND, JR., Toledo. District managers of the molding compound divisions are: J. A. JOYCE, Middle Atlantic area; R. M. McGEE, New England area; C. B. WING, Upper New York area.

● Taylor Instrument Companies have made several personnel changes in its sales organization: J. E. HART is now manager of Boston sales office; R. E. FLIKKEMA, in charge of Tulsa branch office; F. C. FUZZARD, acting manager of Pittsburgh territory, and J. A. GRANT, Philadelphia sales office.

● WILLIAM L. PLATT has been appointed sales representative for Columbia Chemical Div., Pittsburgh Plate Co., with headquarters at the Boston office.

● GUSTAVE HOLMGREN has sold his interest in Badger Plastics, Inc., Fond du Lac, Wis., and severed all connections with the corporation. He is now engaged in developing his own products.

● SIMON ASKIN, assistant secretary of Heyden Chemical Corp., was recently elected a director of American Plastics Corp., New York 1, N. Y.

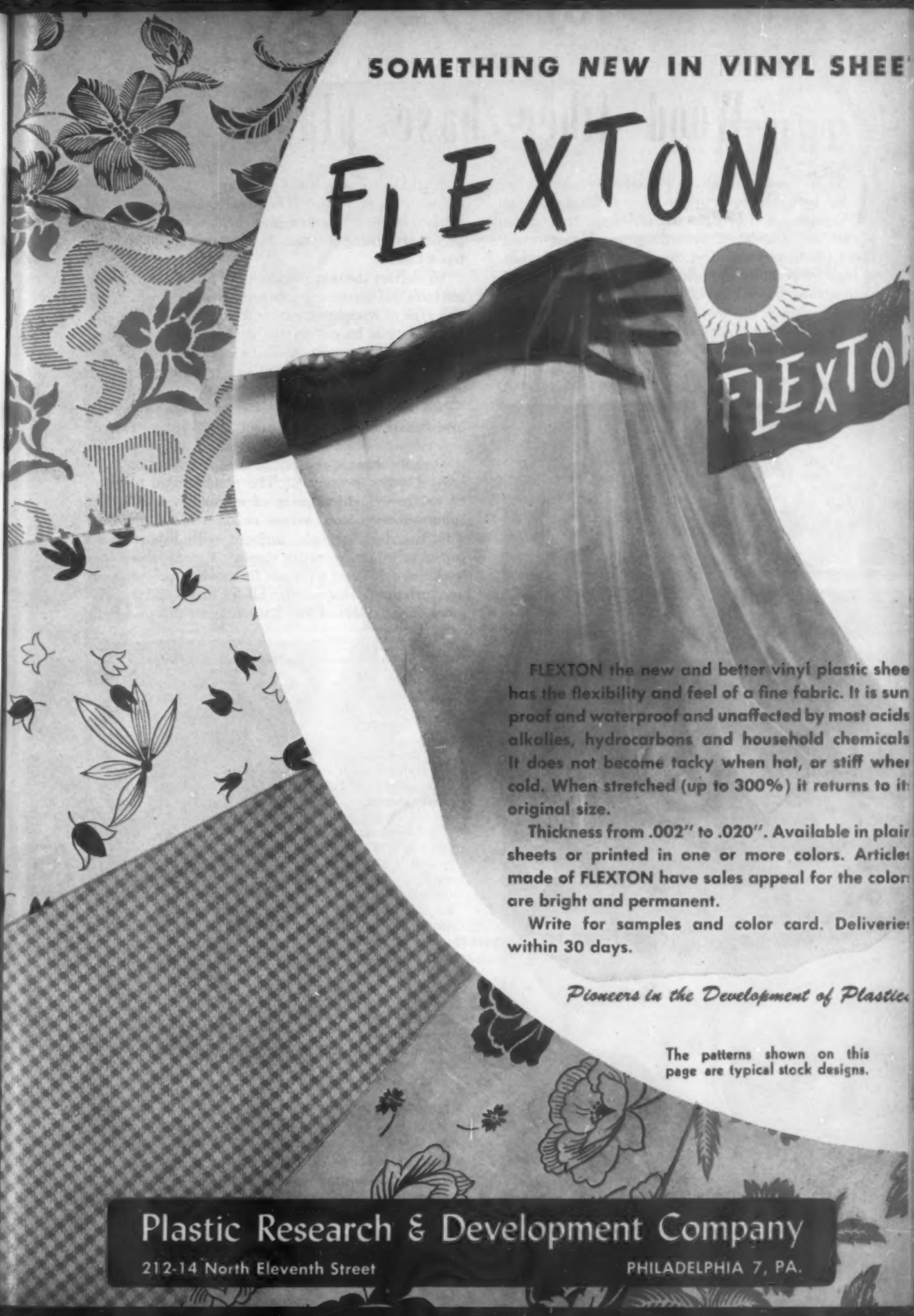
● KARL KOPPLIN has been appointed director of research and development and OWEN P. MERRILL assistant research director in charge of marine development for Vidal Research Corp., Camden, N. J.

● MORRIS GURRIE has joined the operational division of Victory Mfg. Co., Chicago 12, Ill.

● B. F. Goodrich Chemical Co., Cleveland, Ohio, has announced the election of JOHN R. HOOVER as vice-president in charge of sales and ALLYN I. BRANDT as general sales manager of domestic chemical products.

● W. I. BEACH has joined the staff of Henry J. Kaiser Co., Oakland 12, Calif.

● JOSEPH W. PARKS is the new manager of Plastics Div., Owens-Illinois Glass Co., Toledo, Ohio. *(Please turn to page 258)*


SOMETHING NEW IN VINYL SHEE
FLEXTON
FLEXTO
FLEXTON the new and better vinyl plastic shee has the flexibility and feel of a fine fabric. It is sun proof and waterproof and unaffected by most acids alkalies, hydrocarbons and household chemicals It does not become tacky when hot, or stiff whe cold. When stretched (up to 300%) it returns to it original size.
Thickness from .002" to .020". Available in plai sheets or printed in one or more colors. Article made of FLEXTON have sales appeal for the color are bright and permanent.
Write for samples and color card. Deliverie within 30 days.
Pioneers in the Development of Plastic
The patterns shown on this page are typical stock designs.
Plastic Research & Development Company
212-14 North Eleventh Street
PHILADELPHIA 7, PA.

Wood fiber base plastic

A NEW low-cost material, a wood fiber base plastic, has been developed by the United States Gypsum Company and brought out under the trade name of Duron. Composed essentially of ground wood fibers, plasticizers and other chemicals, it can be formed at high temperature and pressure into a wide variety of shapes, though it is generally produced in flat sheets.

In appearance this material resembles a dense hardwood burl, having a mottled low-gloss surface. This is of particular advantage for such applications as trays, and holders where a wood-like appearance is desirable or most appropriate. Duron's greatest peacetime market, however, would seem to be in toys, automotive parts, advertising displays, furniture, wall tile and interior finishes.

To convert the material from sheet form, fabricators use tools and machinery common to wood shops. With this type of equipment, sheets from 0.10 to 0.25 in. in thickness can be cut to the desired size and shape. Sometimes, because of the material's hardness, special alloy steel tools are employed so that a sharp cutting edge may be maintained for long periods.

Not only can this wood fiber base plastic be laminated into thicker blocks that are said to rival the strength and ruggedness of the hardest wood, but it can be treated for greater density, a harder surface and increased water resistance. The material can also be curved to cylindrical areas of unusually short radii, laminated with wood veneer or sheet metal, finished with baked-on enamels, surfaced with lithographed papers or other decorative sheets. Recent laboratory work has developed a process for molding this product into such simple shapes as fan blades, dishes and trays, a procedure that should widen the field for this material.

PHOTOS, COURTESY UNITED STATES GYPSUM CO.

Average Physical Characteristics of Duron

Product name	*Duron 10*	*10T*	*12*	*12T*	*22-S*
Nominal thickness, in.	0.100	0.100	0.125	0.125	0.225
Weight per sq. ft. (air dry), lb.	0.55	0.60	0.72	0.78	0.91
Specific gravity	1.10	1.15	1.10	1.20	0.80
Moisture content, percent	4–6	4–6	4–6	3–5	4–6
Water absorption, 24 hr. at 70° F., percent	20	11	15	11	28
Transverse strength, lb., 8-in. span, 3-in. width	16.0	25.0	25.5	35.0	40.0
Modulus of rupture, lb./sq. in.	6500	9000	6500	9000	3100
Tensile strength, lb./sq. in.	4500	5000	5000	6000	2500
Shear hardness, kilo/0.25 mm. depression with 10 mm. ball	45	65	48	65	20

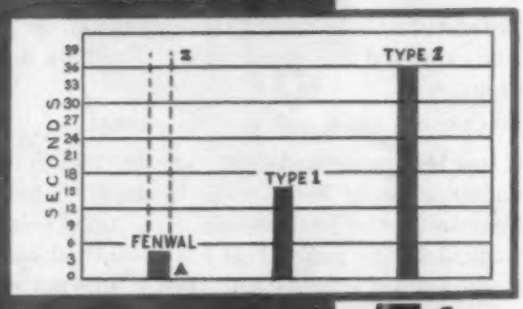
A representative group of parts made from wood fiber base plastic. The material is usually made in the form of flat sheets but a method of molding has been developed. It can be readily laminated into thick blocks, surfaced with decorative sheets, finished with baked-on enamels and laminated with wood veneer or sheet metal

Instant TEMPERATURE DETECTION*

What temperature detection time best fits your product? The fast response of the Fenwal Thermoswitch allows you to engineer into your product the optimum speed of detection—from A to Z. Compare the response time of the Thermoswitch with other thermostats.

Chart shows the time interval required for a Fenwal Thermoswitch to change 10°F. when subjected to a 20° change in temperature. Compare this performance with that of Type 1 and Type 2 thermostats. Proper application can modify this response time to any value desired, from A to Z.

RESPONSE TIME CHART



Study the advantages of Fenwal Thermoswitches before making any commitment, for the Thermoswitch has many advantages which are not found in other types of temperature control units . . . the unique principle of operation of Fenwal Thermoswitches permits extreme accuracy combined with rugged yet compact construction.

Send for your copy of the Thermotechnics booklet which includes "Fourteen Facts in Fenwal's Favor."

CARTRIDGE THERMOSWITCH

CROSS SECTION CARTRIDGE THERMOSWITCH

* 1 of the "Fourteen Facts in Fenwal's Favor".

Fenwal

FENWAL INCORPORATED

ASHLAND MASSACHUSETTS

THERMOTECHNICS FOR COMPLETE TEMPERATURE REGULATION

Flow of thermosetting plastics

(*Continued from page 202*)

From practical experience it has been found that materials with the same minimum force, regardless of closing time, may be interchanged in applications without undue trouble. It has also been found from experience that general-purpose phenolic materials requiring a closing force on the molds between 15,000 and 10,000 lb. are usually stiff, those between 10,000 and 5000 lb. are medium, and those between 5000 and 2500 lb. are considered soft flowing materials.

When unknown materials are tested, it is well to obtain tests at various pressures so that a complete curve can be drawn. For known materials and routine testing, one or two tests are all that are required to establish the position of the curve. In this way many tests can be run in a very short time, particularly when they are used as control tests in the manufacture of thermosetting plastics.

Means of expressing test results

In the past, the words *flow* and *plasticity* have been used to describe the flow properties of a thermosetting plastic. The American Society for Testing Materials proposes the use of the word *mobility*. It is suggested, when this method is used, that the mobility of a thermosetting plastic be expressed as the minimum force required to close the standard cup mold.

For practical purposes measurements using increments of 5000 lb., except for the first step of 2500 lb., seem adequate. However, any desired degree of accuracy can be obtained by dividing the pressure scale into smaller units. It is limited only by the means of measuring and maintaining constant pressure under all conditions of closing the mold.

The flow time can be used for measuring batch-to-batch uniformity. The relative positions of the curves when the minimum pressure or mobility is the same, indicate rate of flow. If it is necessary to express the closing time with pressure, it is suggested that it be written as a subscript, i.e., $5000/_{25}$, meaning that it required 25 sec. for the mold to close under a force of 5000 pounds. The data required for expressing the complete flow characteristics of a material can then be written as a series of such numbers. For example, data for the medium general-purpose phenolic in Fig. 3 are:

25,000/3.3 20,000/10.7 15,000/14.6 10,000/21.4 8,000/29.5 5,000/∞ close

In order to further simplify this expression, each force can be expressed in 100-lb. units. The data are then written:

250/3.3 200/10.7 150/14.6 100/21.4 80/29.5 50/∞ close

It has been suggested from time to time that some autographic device be attached to the press to obtain automatically the relationship of the time versus the movement of the cup. This has been tried and does give some added information. But it does not seem to

A two-piece phenolic and urea ash tray

A new application of phenolic and urea to a high-quality advertising specialty or premium is seen in the ash tray which is featured by the Process Co. of America.

This ash tray is compression molded in two pieces by F. E. Reinhold Co. A cone in the bottom comes up through a center hole in the inverted cone, which forms the top ash receiver, so that when the top is lifted the ashes and butts drop into the bottom. Designed with a wide flange, it has cigarette rests long enough to keep the cigarettes horizontal at all times.

Two methods of applying the advertiser's name and message are used. In one case a removable ring in the mold is tooled so that the name can be carried on the flat circular edge of the top of the ash tray. In the other case, positive and washable application of printing is made on both the top and the side of the bottom part by J. Frank Motson Co.

The item is available in black, brown, maroon, mahogany, ivory, walnut and in combinations of these colors. The printing may be had in any desirable contrasting shades.

FOR RENT

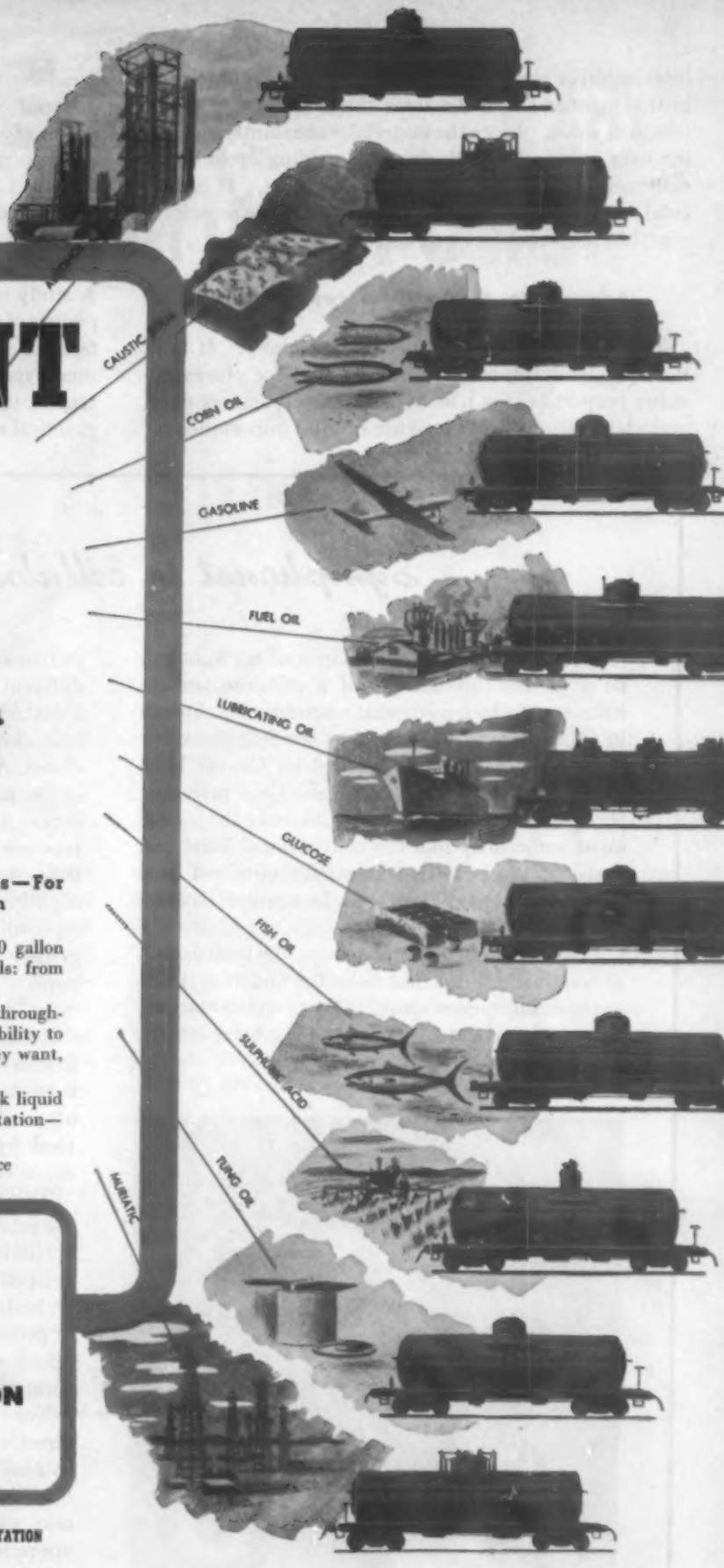
37,000 Specialized Tank Cars—207 Types—For Swift, Sure, Economical Transportation of Liquids in Bulk

GATX tank cars—207 types from 4,000 to 12,500 gallon capacities—haul an almost infinite variety of liquids: from propane to port wine to pine tar.

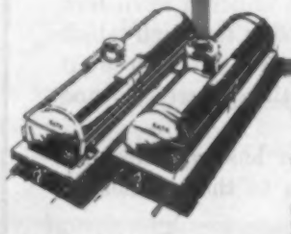
Strategically located offices, plants and repair shops throughout the nation give General American the unique ability to provide shippers precisely the kind of tank cars they want, *when* they want them, *where* they want them.

These tank cars are for rent. So, if the cargo is bulk liquid and the problem safe, fast, economical transportation—count on General American.

Take your tank car problems to our nearest office



GENERAL AMERICAN TRANSPORTATION
CORPORATION
CHICAGO



GENERAL AMERICAN TRANSPORTATION
CORPORATION

General Offices: 135 S. La Salle Street, Chicago 3, Ill.

DISTRICT OFFICES

New York	Los Angeles	New Orleans
St. Louis	Dallas	Tulsa
Buffalo	Houston	Cleveland
Seattle		Pittsburgh

be essential or worth the trouble. The curves obtained in this manner are of the same shape and are of little practical value. Since the material is constantly changing over a wide range during the molding cycle, it is extremely difficult to interpret such curves. It is the total energy and time consumed in molding the complete cup that are important and useful.

Advantage of modified cup method

The advantages of this method are many. It is a fast, practical test which can be useful for observing many properties of a plastic, such as appearance, cure and ability to mold. These are of vital importance to a molder. It can be used to show what happens to materials when they are preheated electronically or by means of an oven.

When material can be used in powder or pill form, the effect on flow characteristics can be shown without any difficulty.

This method can be used to test all types of thermosetting plastics, fabric-filled as well as general-purpose. A study of the time-pressure curves gives a complete picture of the material for all practical purposes. Those familiar with the molding characteristics of the common types of thermosetting materials can quickly interpret the result of the tests and then put them to a practical use.

Symphonet in cellulose acetate

Musical moments for children of all ages can be a reality through use of a cellulose acetate instrument which somewhat resembles the clarinet in appearance and is known as the Symphonet.

The unit is injection molded by Cruver Mfg. Company. Handy-Folio Music Co., manufacturer, has made a special effort to make the instrument sufficiently like the conventional band and orchestra pieces so that knowledge obtained from playing the Symphonet can be applied in later musical education.

Produced in black in one piece, the instrument, although simplified, has holes for fingering which approximately correspond to those on the clarinet, saxophone or flute. There are six holes on the instrument and by closing them one by one, different notes are produced. Thus, with no holes closed, middle C is produced; with the first hole closed, B; with the first and second holes closed, A, and so forth. The instrument is chromatic and has a two octave range, the second octave being fingered the same as the first and produced on the same principle as that of the flute—by tightening the lips and blowing with slightly more force. A series of books written especially for the plastic instrument contains graded musical selections to be learned by the pupil.

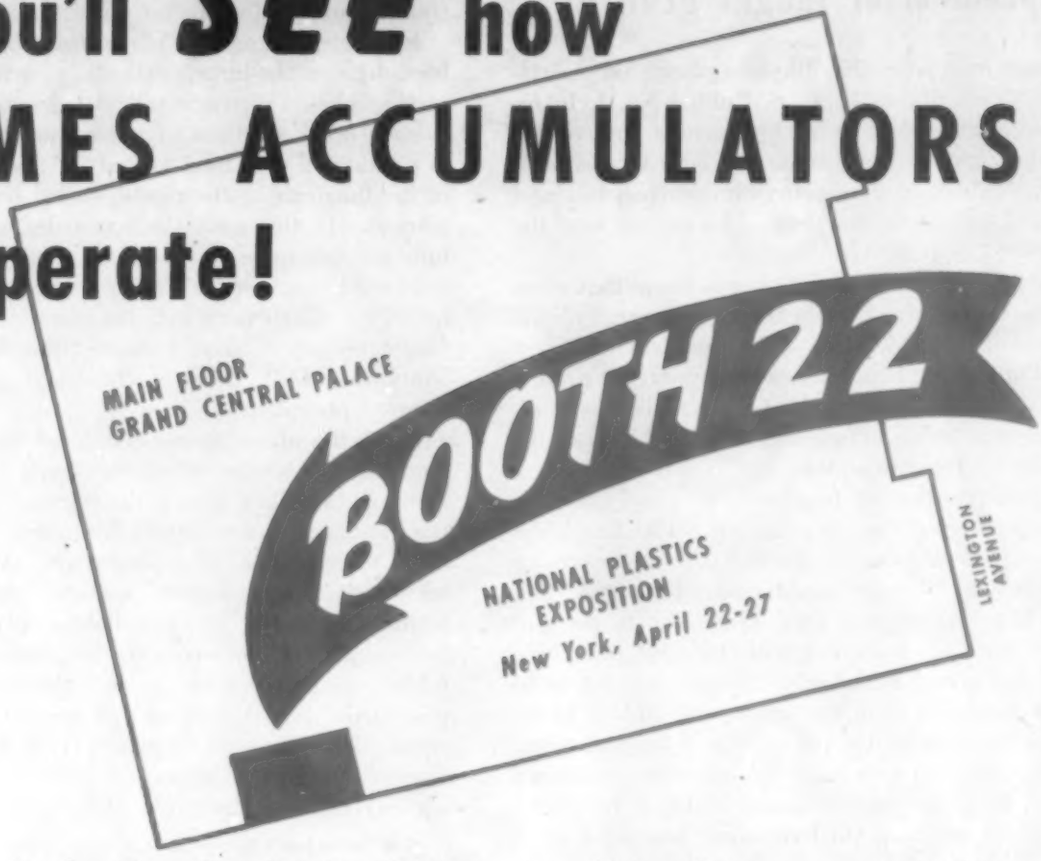
An added feature is the ridging between the fingering holes which is intended to guide the fingers in locating the holes. A thumb rest makes it easier to hold and balance the instrument. An attachable metal music holder similar to those used by marching bands is provided, making a music stand unnecessary.

The instrument was first produced for use in the schools, particularly in the lower grades where aptitudes in music may be discovered and developed, pending a transition to regular band or orchestra instruments, or in all grades of schools in poorer communities where the students cannot afford expensive instruments but need musical training to supplement vocal work.

The value of the Symphonet lies in many directions. Through its use, children learn how to read music, develop a feeling for pitch which helps their singing and inspires in them what may well prove to be a lifetime interest in and appreciation of music.

Recently the manufacturer has expanded distribution of the instruments to the toy field.

You'll *SEE* how ELMES ACCUMULATORS Operate!



Don't miss the animated explanation of Elmes air-ballasted accumulator operation—a *"first"* for the First National Plastics Exposition. You'll see how flow to and from the accumulator, and from the pump, is coordinated *automatically* to maintain predetermined levels within the vessel—how line shocks are eliminated for *protection* of piping and presses—why Elmes accumulators maintain abundant pressure reserve; need no *internal* moving parts; take so little space.

THREE OPERATING UNITS

You'll see two sizes of popular Elmes laboratory presses in operation, 2-column 20-ton and 4-column 30-ton models, useful for many plastic purposes ranging all the way from research to actual production. There will be an operating hobbing press, too, to show why Elmes' compact strength means so much in *precision* work.

YOUR INVITATION

The Elmes booth will be staffed by specialists in hydraulic production equipment — high-pressure pumps, accumulators, compression and transfer molding presses. *Come in.* There couldn't be a better time to talk things over.

ELMES

Put Your Pressing Problems up to ELMES

ELMES ENGINEERING WORKS
of AMERICAN STEEL FOUNDRIES
225 N. Morgan St., Chicago 7, Ill.
Also Manufactured in Canada

HYDRAULIC EQUIPMENT

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

The problem of fungal growth

(*Continued from page 195*) dihydroxydichlorodiphenylmethane (Preventol GD), U. S. Rubber No. 3, Intracol, Hydrocide 10X Special (quaternary ammonium compound), copper naphthenate, Shirlan Extra (salicylanilide), Milban (zinc dimethyldithiocarbamate) and Merck 242 (tetrabromo-*o*-cresol). In no case were the treated plastics fungistatic.

In connection with this study it was found that when starch-sized duck was used in the laminate, the plastic was more susceptible than when de-sized duck was used. Paper-base laminates were easier to protect than cloth-based plastics. When phenolic-glass laminates are susceptible to fungal growth, the sizing on the glass cloth is often responsible.

The incorporation of fungicides in vinyl chloride-acetate copolymer was also studied. The fungicides were incorporated into the mix in 2 percent concentration. Preventol, copper naphthenate, Hydrocide 10X Special and Milban gave some protection to the material which was plasticized with tricresyl phosphate and methyl acetyl ricinoleate. Milban seemed to be the best fungicide from the standpoint of soil burial tests. After hanging for 100 days in a tropical room, the plastics treated with fungicides were less overgrown by fungi than the control sample. Thus, fungicides in polyvinyl materials do have some beneficial effect in 2 percent concentration, and possibly higher concentrations would afford better protection.

A considerable amount of experimental work has also been done on the incorporation of mercurial fungicides such as phenyl mercuric salicylate, in thermoplastics.[5] Concentrated solutions of phenyl mercuric fungicides in plasticizers were used so that the final concentration of the fungicide in the plastic varied from 0.25 to 2.0 percent. In this work the fungicides had to be carefully purified to be effective, and when such fungicides were used they were not easily removed by heating or leaching. Plasticizers that are compatible with these fungicides are dibutyl tartrate, dimethyl phthalate, Santicizer M-17, triacetin, triphenyl phosphate and tricresyl phosphate.

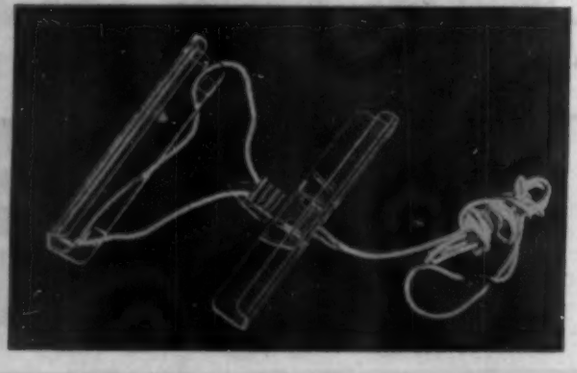
Using the above mentioned fungicides it has been found that a number of plastics could be made fungistatic in that they passed the Signal Corps Specification 71-2202A using *Aspergillus niger*. Tests with a spore mixture were also conducted. Among the cellulose plastics, cellulose acetate plasticized with Santicizer M-17, ethyl cellulose plasticized with Santicizer M-17 or tricresyl phosphate, and cellulose nitrate plasticized with tricresyl phosphate have been protected. Polystyrene as well as contact laminating resins of the styrene copolymer type have also been rendered fungistatic by the use of 0.5 to 1.0 percent of a phenyl mercurial fungicide. Vinyl copolymers are also

[5] H. E. Smith, Insl-X Co., and A. D. King, Plasticides, Inc.

A methyl methacrylate picture frame

When is a frame not a frame—when it's a cleverly designed Braquette which, by means of two short Lucite holders, several yards of cord and a metal lock, holds pictures in place and yet does not obtrude itself into the drawing.

Braquette, Inc., is the manufacturer of this item which has done much to release picture-hanging from the limitations of taste, expense and scope imposed on it by older methods.



Injection molded of clear methyl methacrylate by Boonton Molding Co., the ingenious device makes possible the framing of any picture ranging from 2 in. to 3 ft. in depth.

Directions are simple, making the operation a remarkably speedy one. The illustration is placed on a mount between two pieces of glass of the same size as the mount. The plastic holders are then slipped over the top and bottom of the picture so that the cord connecting them falls in the back. The cord is pulled tight and the lock snapped in place. After 24 hr. the cord should be pulled up slightly to take up the slack. A convenient hook is provided for use in hanging.

Museums, art galleries, schools and professional photographers are reported to be using this framing unit widely, since with it exhibits of pictures, such as water colors, prints and photographs, can be changed almost instantaneously by simply adjusting the length of the cord. Moreover, the methyl methacrylate blends with any type of picture and with any interior decoration motif.

See it at the Plastics Show

. . . Protects your molds, your machines, your products

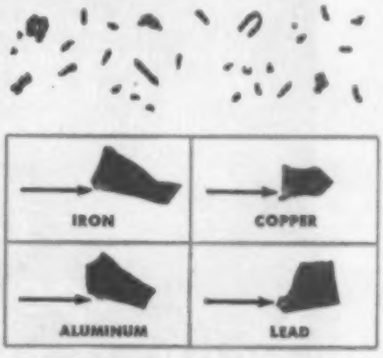
This new unit provides a quick, sure way to detect metal particles, of any kind, in non-metallic materials.

The product being inspected—such as plastic preforms—is conveyed by belt or other means through the inspection aperture.

Here it is screened by a high-frequency electromagnetic field and, if metal is present, causes a reaction which is detected by an electron-tube amplifier. This, in turn, triggers a bell or lamp and the faulty product is automatically rejected and/or marked.

Small, as well as large pieces of metal, are detected even when deeply embedded in the material. Discrimination can be adjusted to fit conditions. Operation is rapid—conveyor speeds up to 600 feet a minute are possible without loss of efficiency. It is easy to operate. Operating costs are low—uses only 140 watts. Installation is easy—"all-in-one" construction simplifies wiring, saves space. Available in 4-, 7-, and 12-inch aperture heights to meet varying product requirements.

You will find that this RCA electronic metal detector will quickly pay for itself by preventing machinery damage, reducing lost production time, and increasing customer good-will. Write for new bulletin *today*. Radio Corporation of America, Dept. 55-D, Electronic Apparatus Section, Camden, N. J.

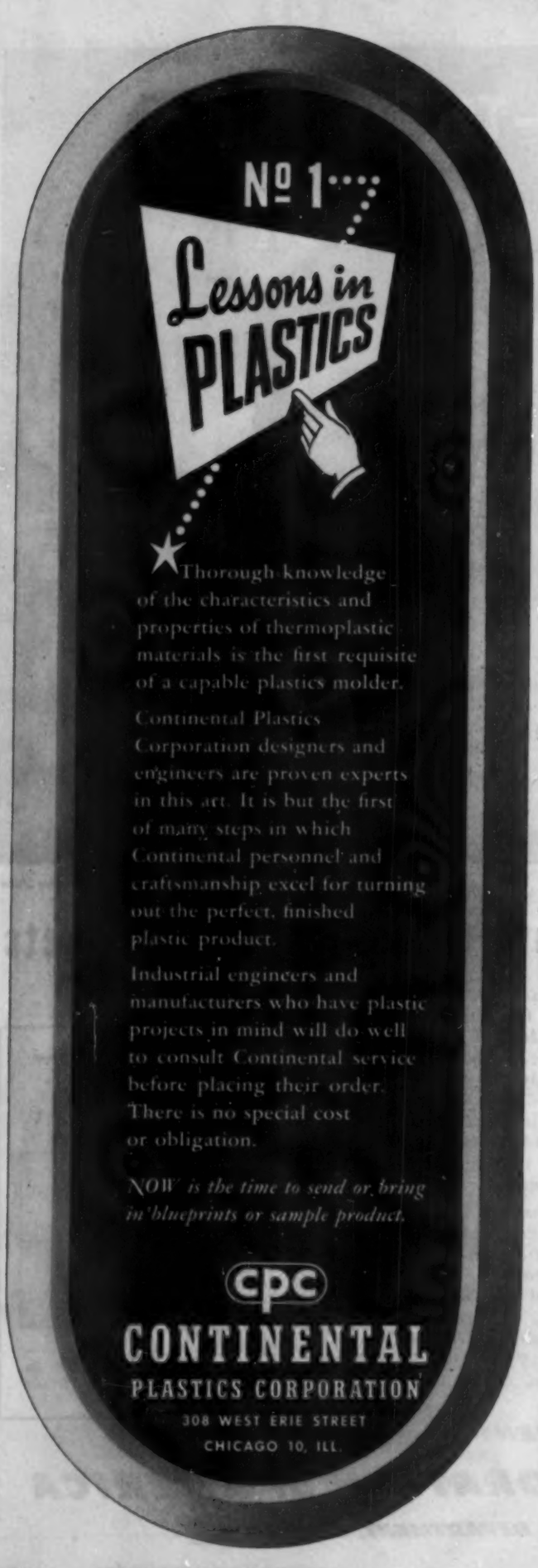


Detects every type of metal and alloy—These metal particles were detected in plastic preforms by an RCA electronic metal detector.

ELECTRONIC EQUIPMENT

RADIO CORPORATION of AMERICA

ENGINEERING PRODUCTS DEPARTMENT, CAMDEN, N.J.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Lessons in PLASTICS
Thorough knowledge of the characteristics and properties of thermoplastic materials is the first requisite of a capable plastics molder.
Continental Plastics Corporation designers and engineers are proven experts in this art. It is but the first of many steps in which Continental personnel and craftsmanship excel for turning out the perfect, finished plastic product.
Industrial engineers and manufacturers who have plastic projects in mind will do well to consult Continental service before placing their order. There is no special cost or obligation.
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rendered fungistatic by the incorporation of less than 1 percent of phenyl mercuric salicylate.

Phenolic resins are much more difficult to protect, possibly due to the presence of formaldehyde which reacts with the mercurial fungicide at high temperatures. A phenol-formaldehyde, cellulose-filled plastic was made fungistatic by the addition of 2 percent phenyl mercuric fungicide. Sometimes 1 percent fungicide was sufficient. However, from an overall picture it is the consensus of opinion that phenolic plastics, especially laminates, are the most difficult to protect, and results are still inconsistent. Urea-formaldehyde molding powders do not lend themselves readily to the incorporation of fungicides.

The problem as to health hazard has also been investigated to some extent. There has been some criticism of mercurial fungicides because of their toxicity to human beings. In a report describing tests to determine the irritant and sensitization properties of fungicides in a polyvinyl plastic, it was found that the mercurials caused moderate to severe irritation.[6] However, proponents of these fungicides claim that toxicity is not a factor in the low concentrations in which these materials are used.

No experimental work has been done on the problem as to whether the fungicide exists unaltered in the plastic after manufacture. Elementary analysis for such a constituent as mercury, nitrogen or sulfur means little because this would not indicate whether further reaction of the compound with components of the plastic had occurred. The only indication that fungicide does exist unaltered, at least in thermoplastic materials, is the increased fungal resistance of the materials.

In summarizing, it can be said that a great deal of work remains to be done. As of today no treatment is known that will inhibit growth of fungi on all plastics, and if this is the desired goal, the problem is far from solved. However, in a general way, thermoplastic materials can be made more resistant to fungi by incorporating fungicides in the plastic. The situation with phenolic materials is more obscure, and at present the incorporation of fungicides in susceptible laminates does not alter their fungal susceptibility appreciably.

[6] "Patch testing to determine the irritant and sensitization properties of various materials," Medical Field Research Laboratory, Camp LeJeune, North Carolina (March 6, 1945).

Polystyrene molding powder

(*Continued from page 151*) and of standard styrene formulations. Since the material offers good flow characteristics, residual strains are kept to a minimum. Laboratory tests indicate that maximum service temperatures of 90° C. (194° F.) should be satisfactory for most moldings of this material.

Even for parts made of heat-resistant thermoplastics, moldings of this styrene copolymer show extremely low shrinkage. However, the values presented in Table I should be considered tentative since shrinkage is affected by molding conditions, size and shape of part,

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Here are a few of the subjects covered:

- When to use molded plastics (also when *not* to use them).
- Choosing the right material.
- Comparative physical properties of molding materials.
- The molding process.
- How molds are made.
- Relationship between mold cost and piece part cost.
- Designing for plastic molding.

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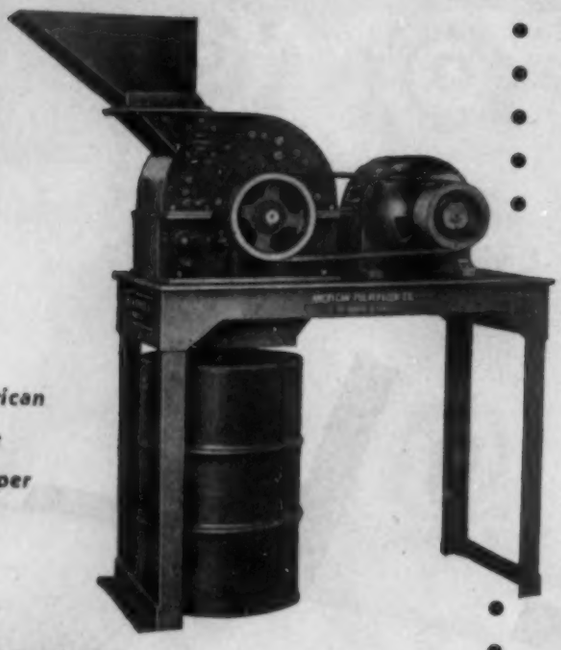

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and other factors. As for strength, the new formulation represents a marked improvement not only over standard styrene powders but over Plexiglas as well. Its strength is particularly good in relation to a low specific gravity which is 1.08.

Like standard styrene, this new molding compound has somewhat lower dielectric strength than acrylic resin. While its arc resistance is superior to styrene, it does show tracking after 140 ± 10 sec. as compared with acrylics which do not track. Again its dielectric constant is appreciably lower than that of Plexiglas, and its power factor much lower still, though not as low as that of unmodified styrene. Preconditioning, like drying for 7 days at 50° C. (122° F.) and immersing in water for 7 days, has no appreciable effect on the electrical properties of Plexene M except that water immersion does cause a slight increase in power factor at 1 million cycles and slight loss of dielectric strength.

Parts molded of this styrene copolymer show excellent resistance to weathering. Neither 6 months' exposure at Bristol, Pa., latitudes, nor 200 hours' accelerated aging (alternate S-1 sun lamp and dew cycles) had any appreciable effect on the shape, dimensions or color of typical standard samples. The material is also resistant to gasoline and commercial inks and practically unaffected by acids, alkali and dilute alcohol. However, organic solvents such as acetone and ethylene dichloride will attack the material.

Up to the present time, the limited available quantities of this new styrene copolymer have been used for fountain pens and pencils, but its use is by no means restricted to these fields. It would appear that, among other applications, Plexene is particularly well suited for use in special types of containers where its resistance to gasoline, alcohol and acids can be of use.

News of the Industry

(*Continued from page 246*)

● The Naugatuck Chemical Div., U. S. Rubber Co., Naugatuck, Conn., has disclosed plans to spend more than $2,000,000 to expand plant facilities. This is part of a three-year program to meet increased demands for production of plastics, rubber chemicals, latex, dispersions and agricultural chemicals.

● Chicago Molded Products Corp., Chicago 51, Ill., has announced a program of expansion to involve extensive additions to present buildings and plant equipment. As a first step, the building occupied by Patton Tractor Co. has been acquired. New presses purchased include injection molding machines and compression molding presses of the automatic-cycle and double ram types.

● Luther L. Yeager has joined the staff of the Bjorksten Laboratories, Chicago, Ill., as a research chemical engineer, in the plastics department. Mr. Yaeger was formerly associated with the Youngstown Sheet and Tube Company.

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— production volume does not justify die costs . . .

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- **Ease of forming**
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- **Great strength with light weight**
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Large or small complicated parts can be laid up and formed in one operation, resulting in a dimensionally stable monolithic or monocoque structure, having great strength with light weight. In the production of custom bodies, for example, the necessity for costly dies and machining is avoided and extremely important time and cost savings are possible.

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In Canada, Fiberglas Canada Ltd., Oshawa, Ontario.

Owens-Corning Fiberglas Corporation does not manufacture resins or fabricate laminates, but will be glad to supply experimental samples of Fiberglas and data on techniques in its use with plastics.

FIBERGLAS

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for PLASTICS

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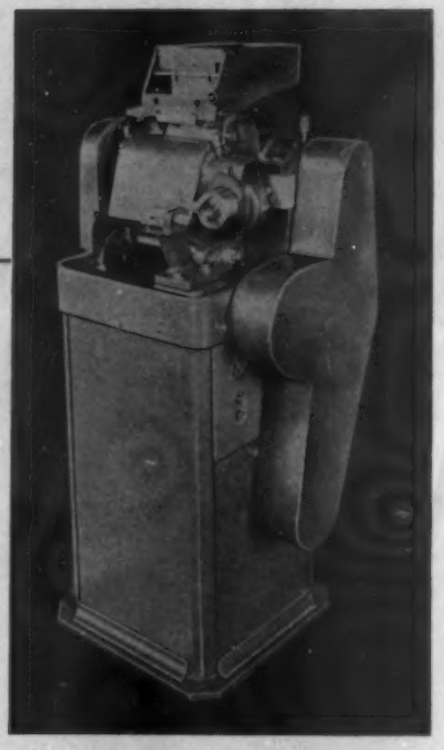

Automatic form grinding of all kinds of industrial shapes, beads, balls, and jewelry items. One operator can handle from four to six of these machines

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Fast and accurate centerless grinding of round rod plastic materials.

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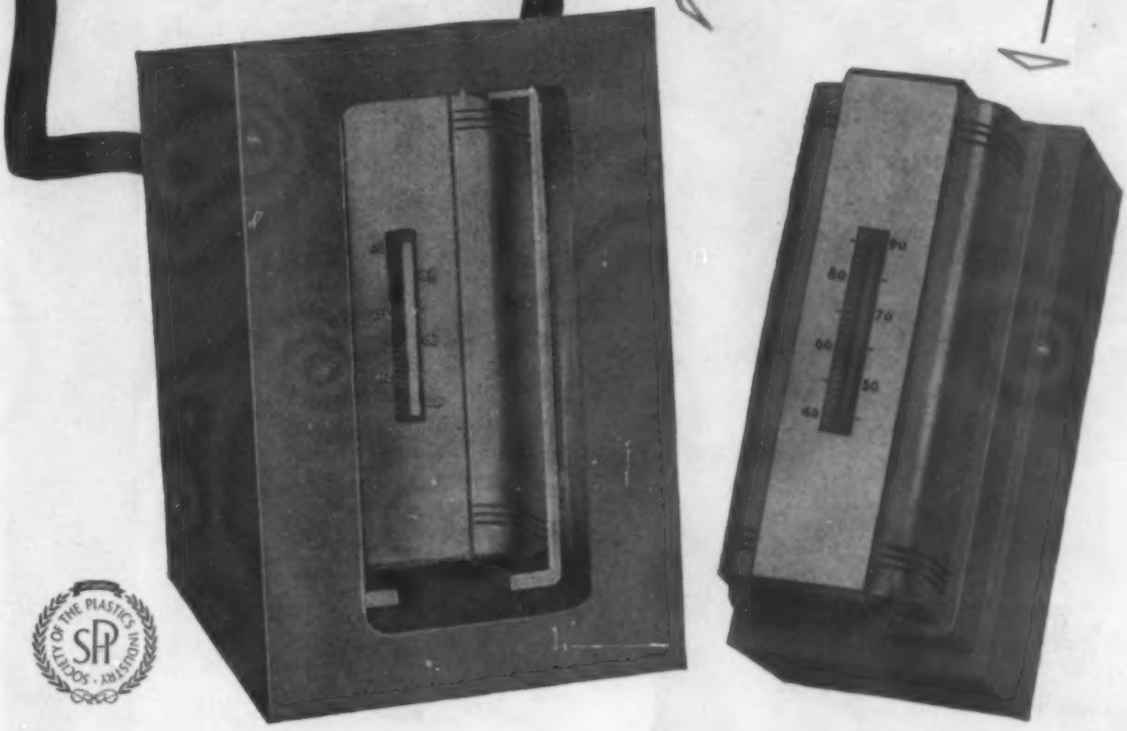
RAISED LINES, STEPS AND LETTERS — IN — Hobbed Cavities by Midland



● When you have a mold problem that combines intricate details and complications, bring it to Midland. Over the years we have developed the special skills necessary to make perfect hobbed cavities of the difficult-to-make variety. Shown above is a hob and cavity by Midland that includes raised lines, steps, and letters.

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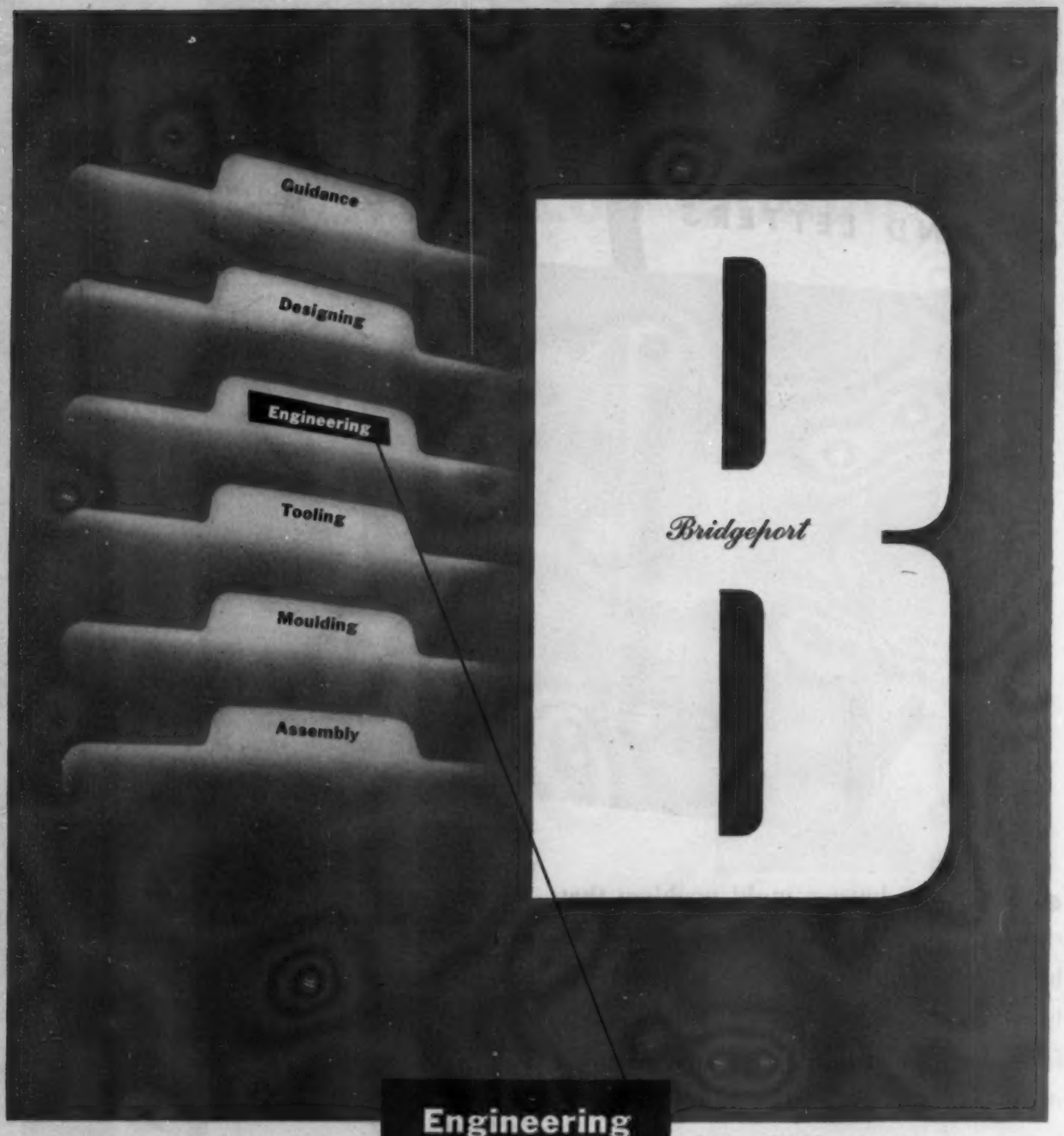

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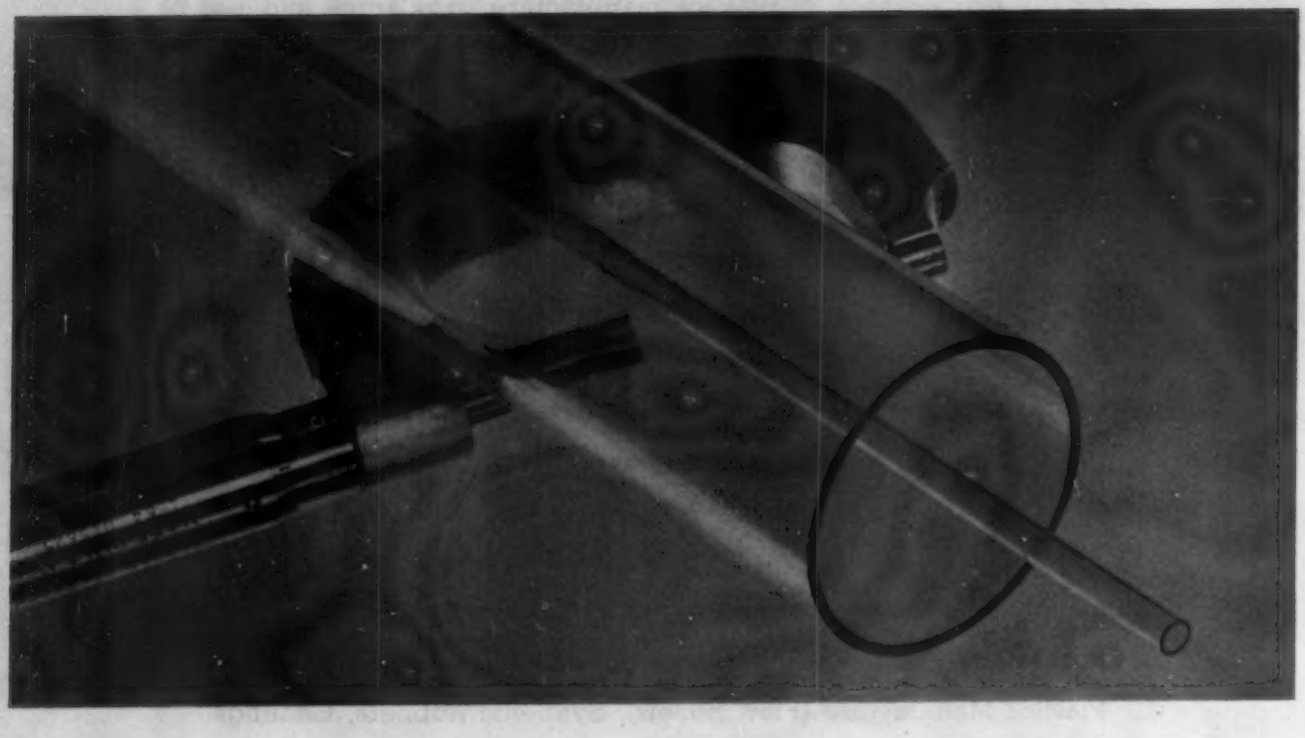

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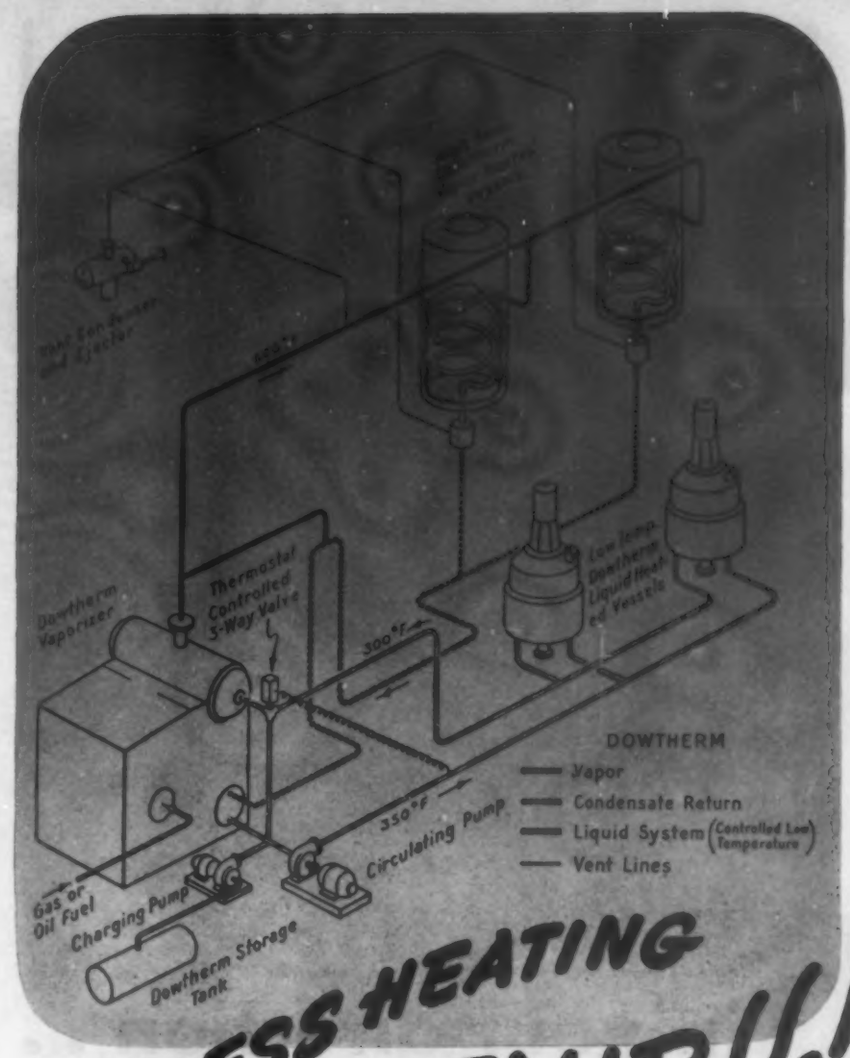

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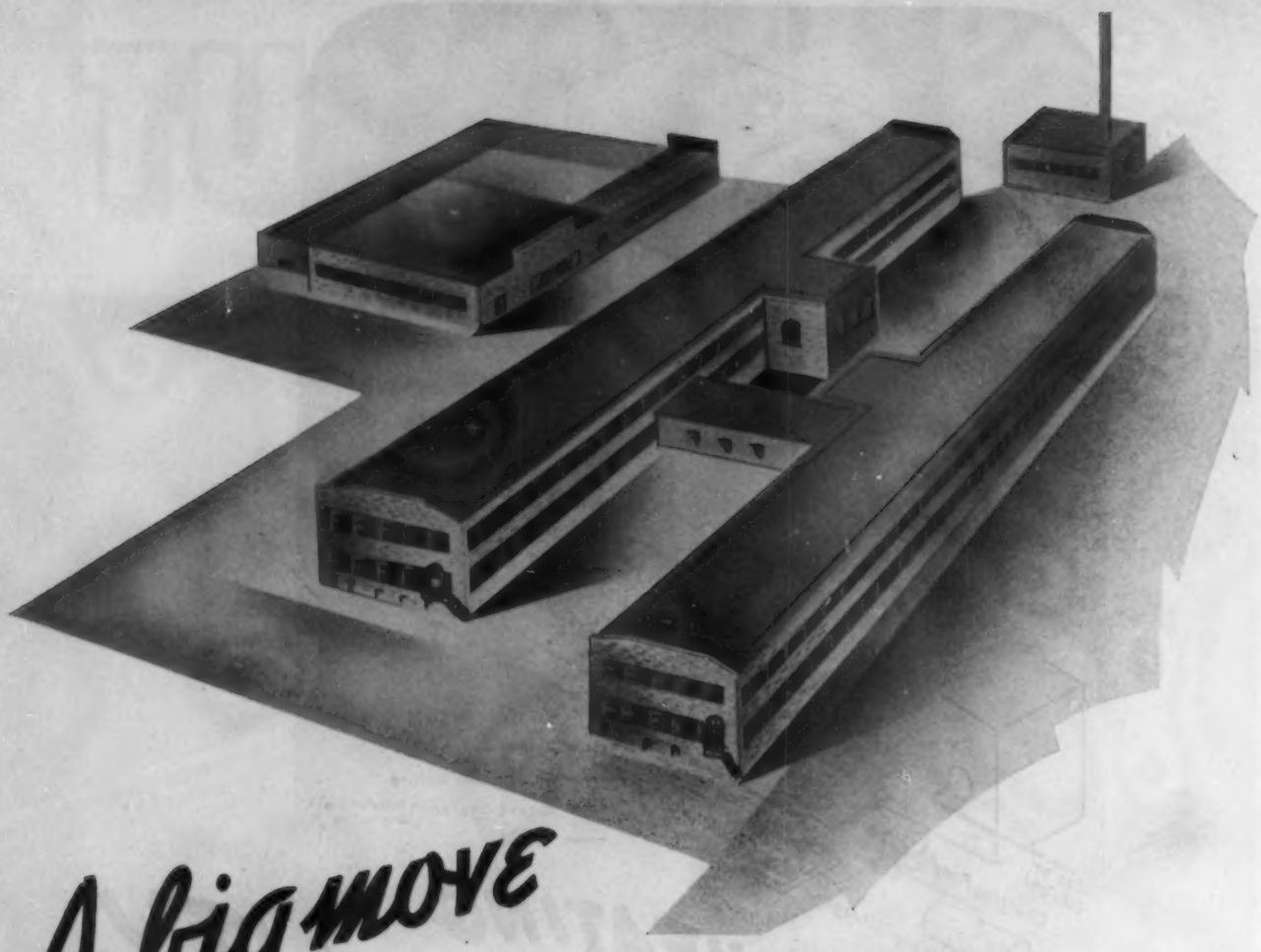

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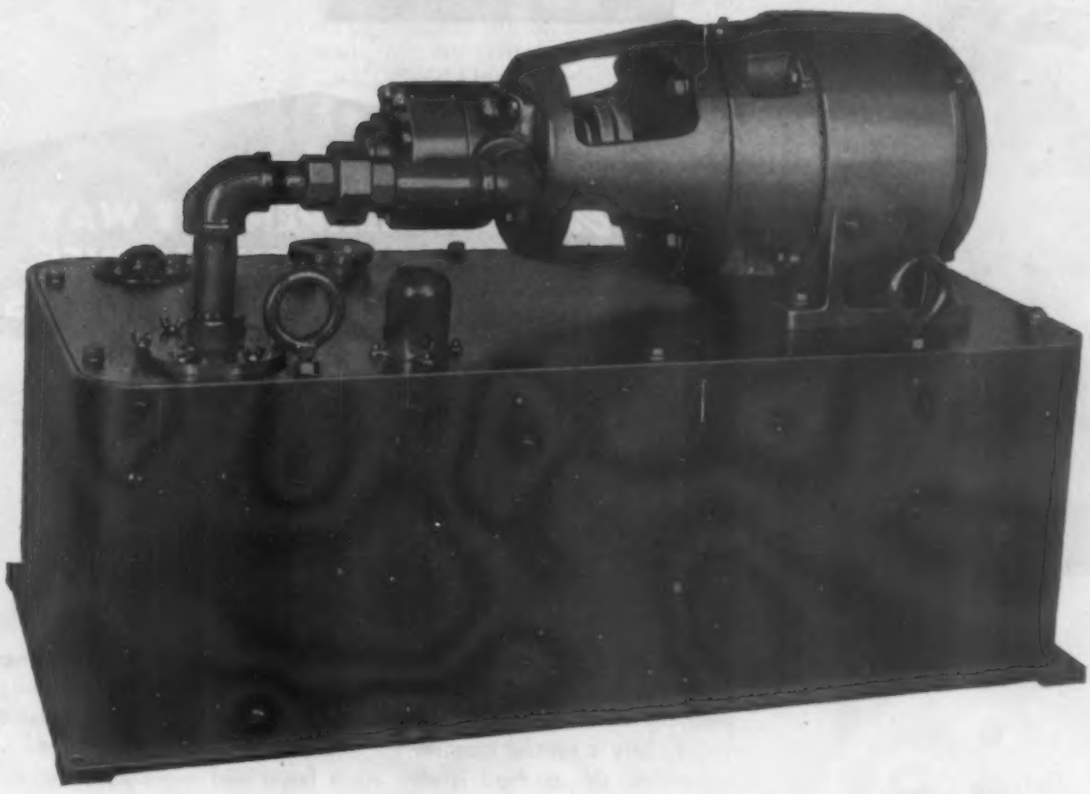

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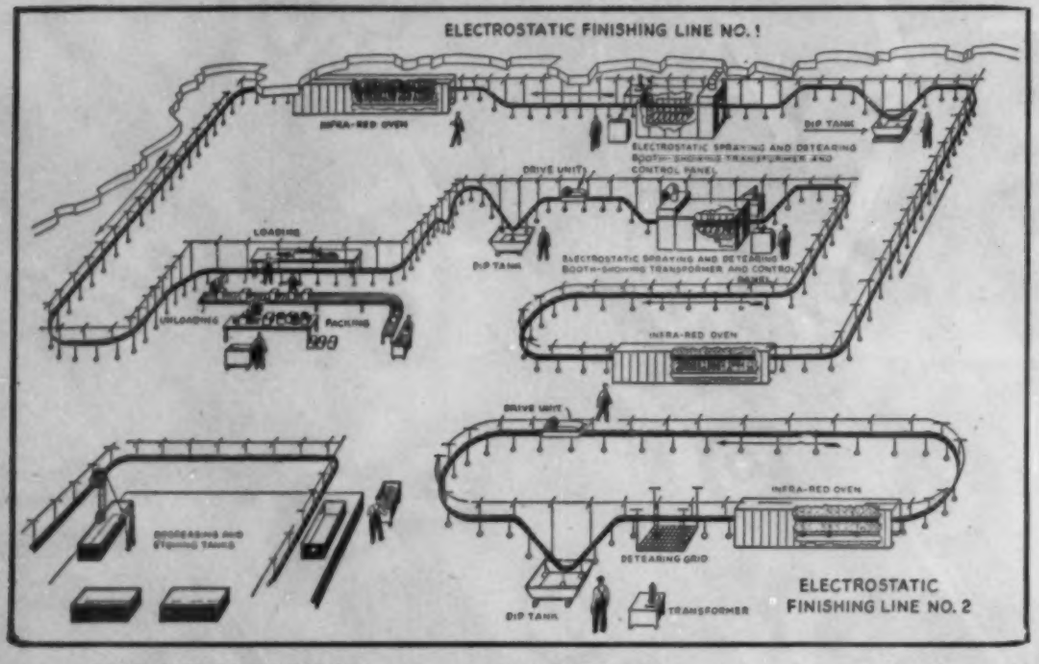

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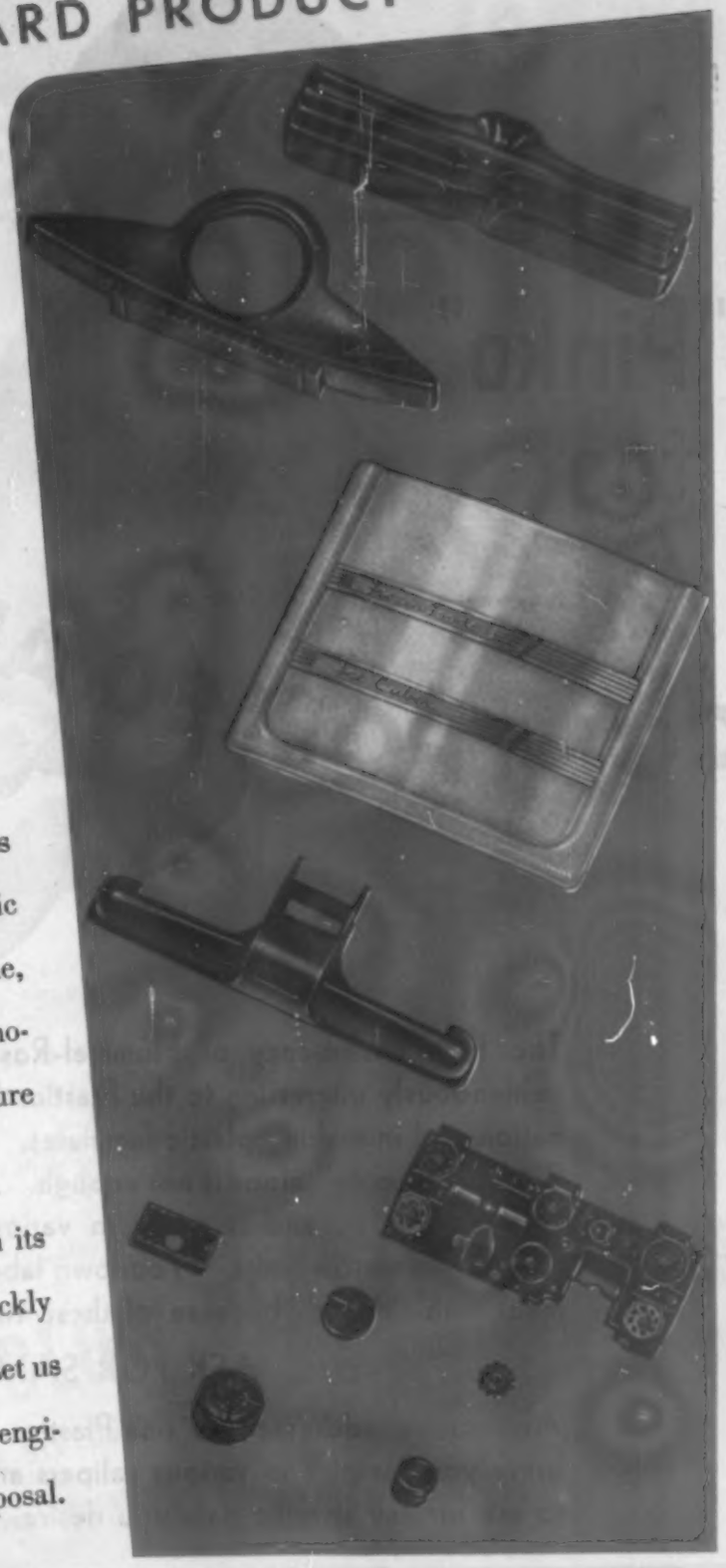

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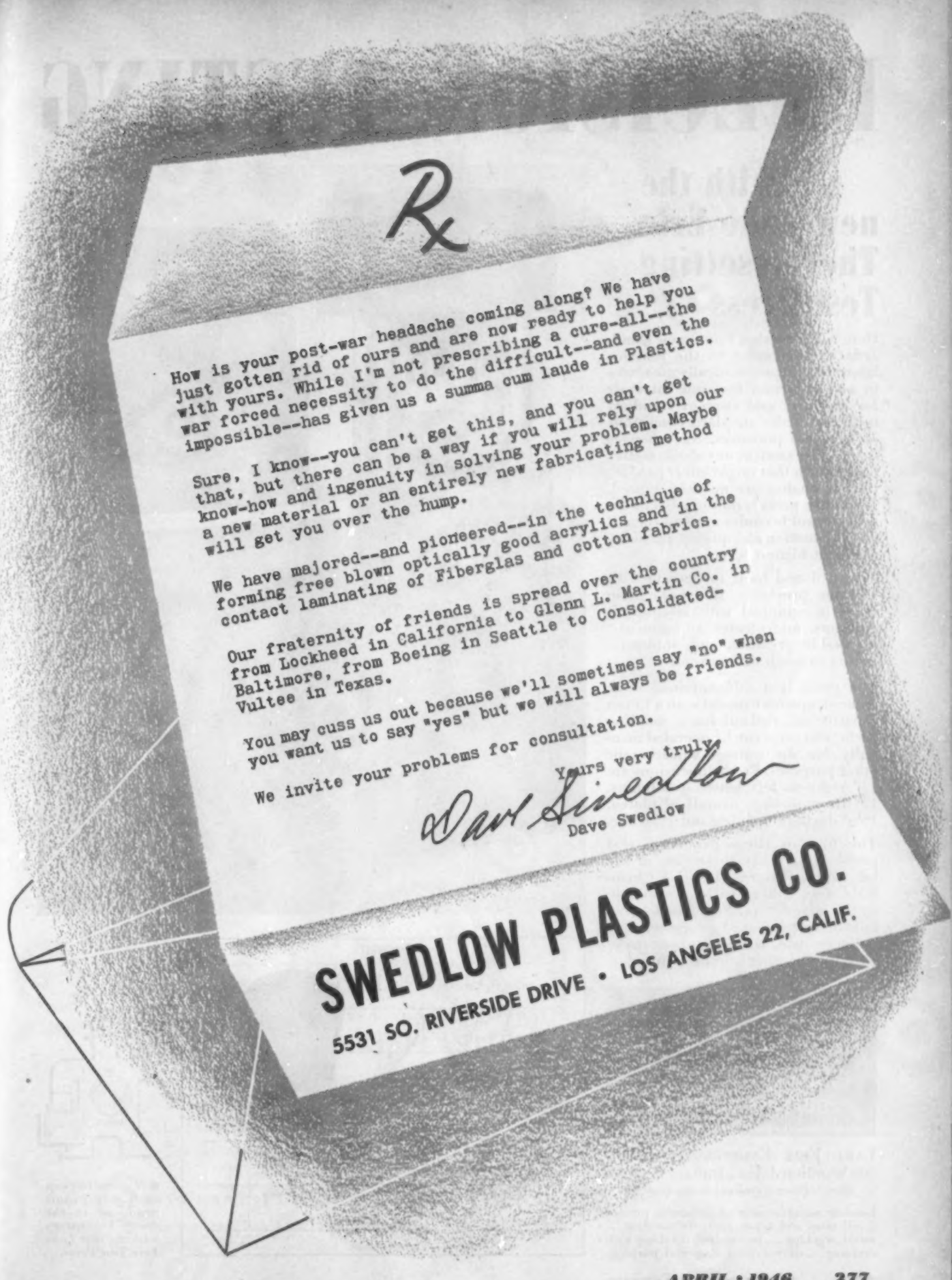
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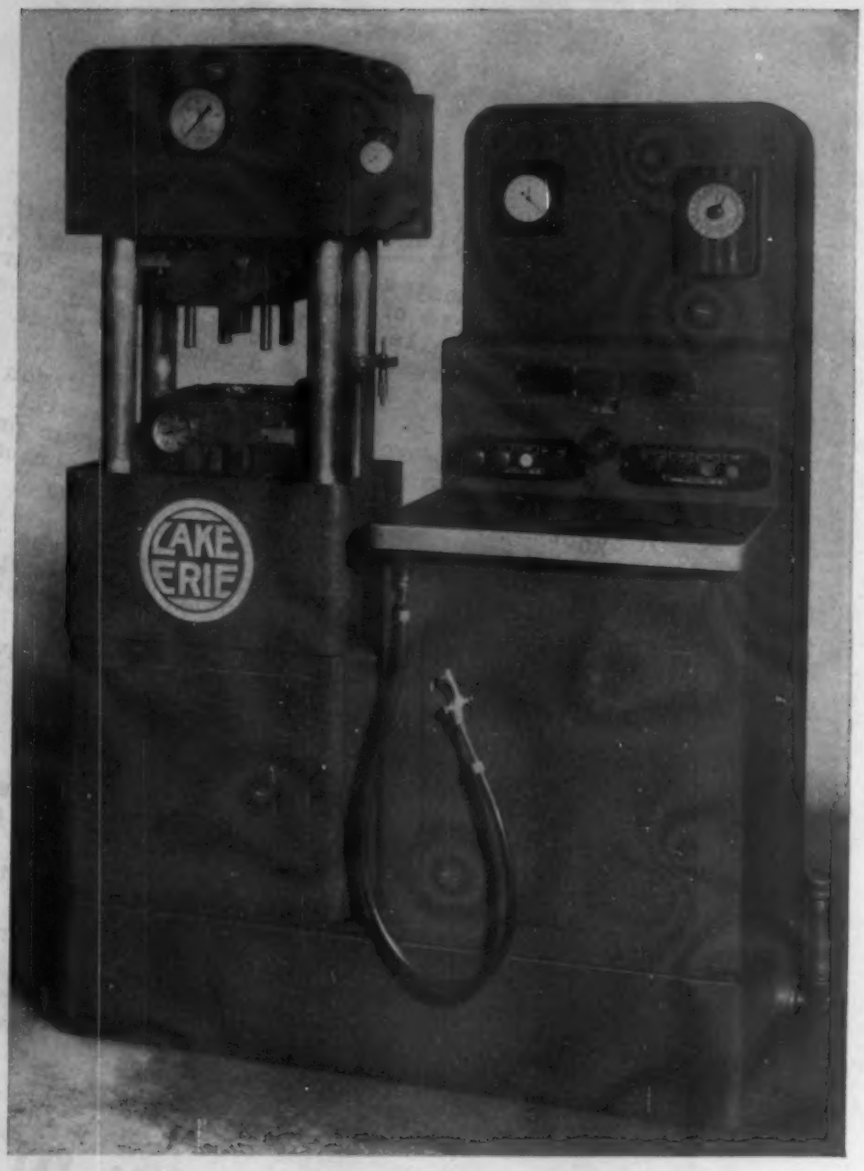

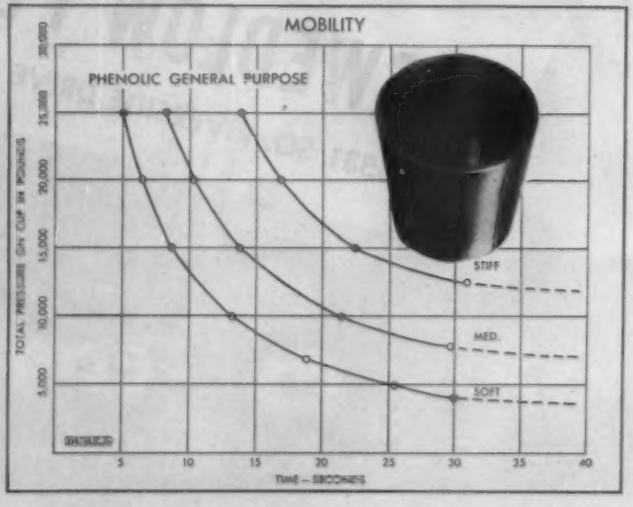

● *Typical test cup and mobility chart produced in the Durez laboratory with the new Lake Erie Test Press.*

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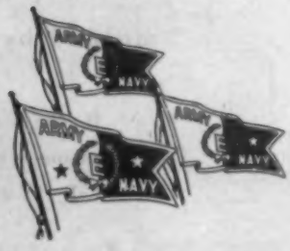

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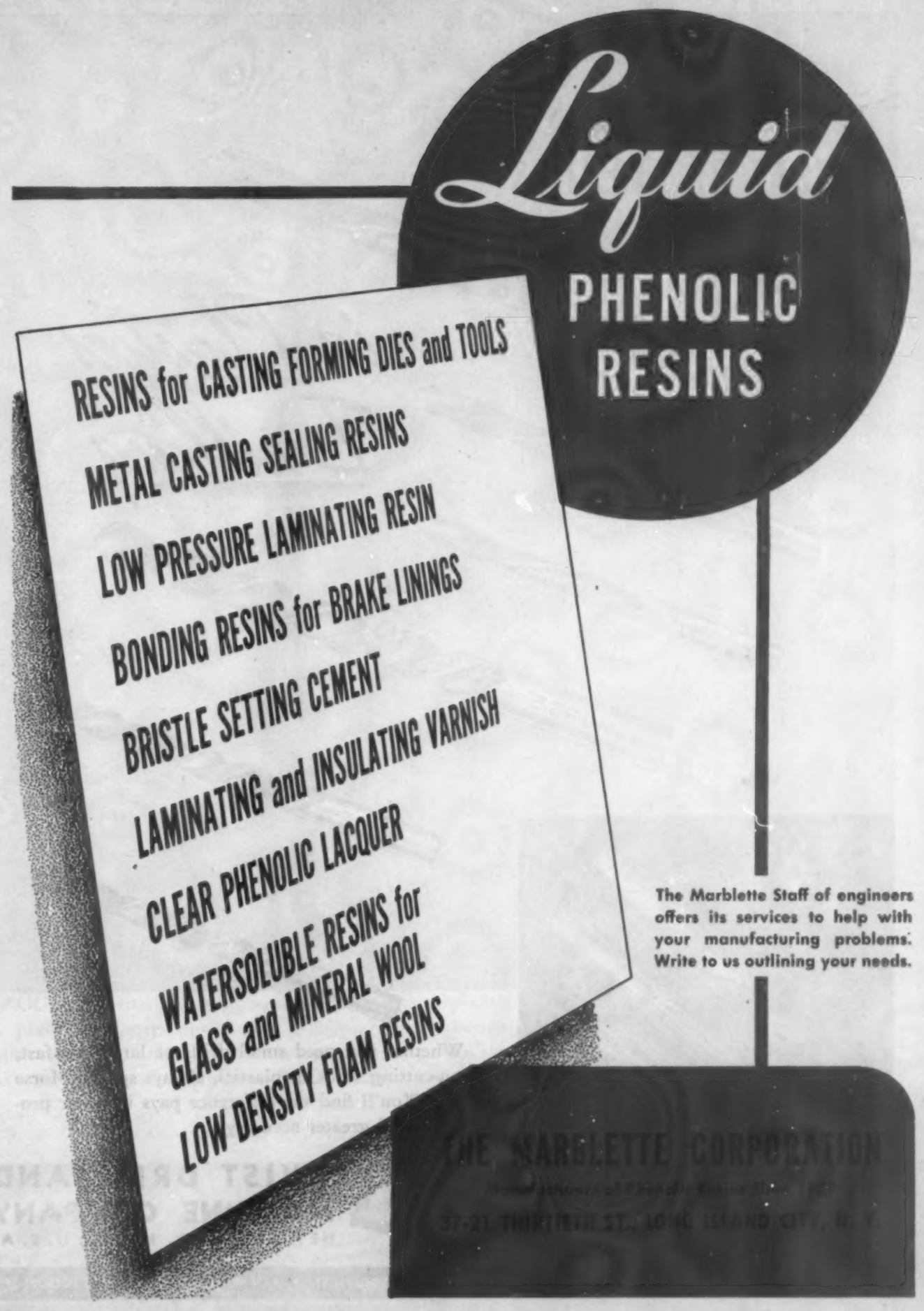
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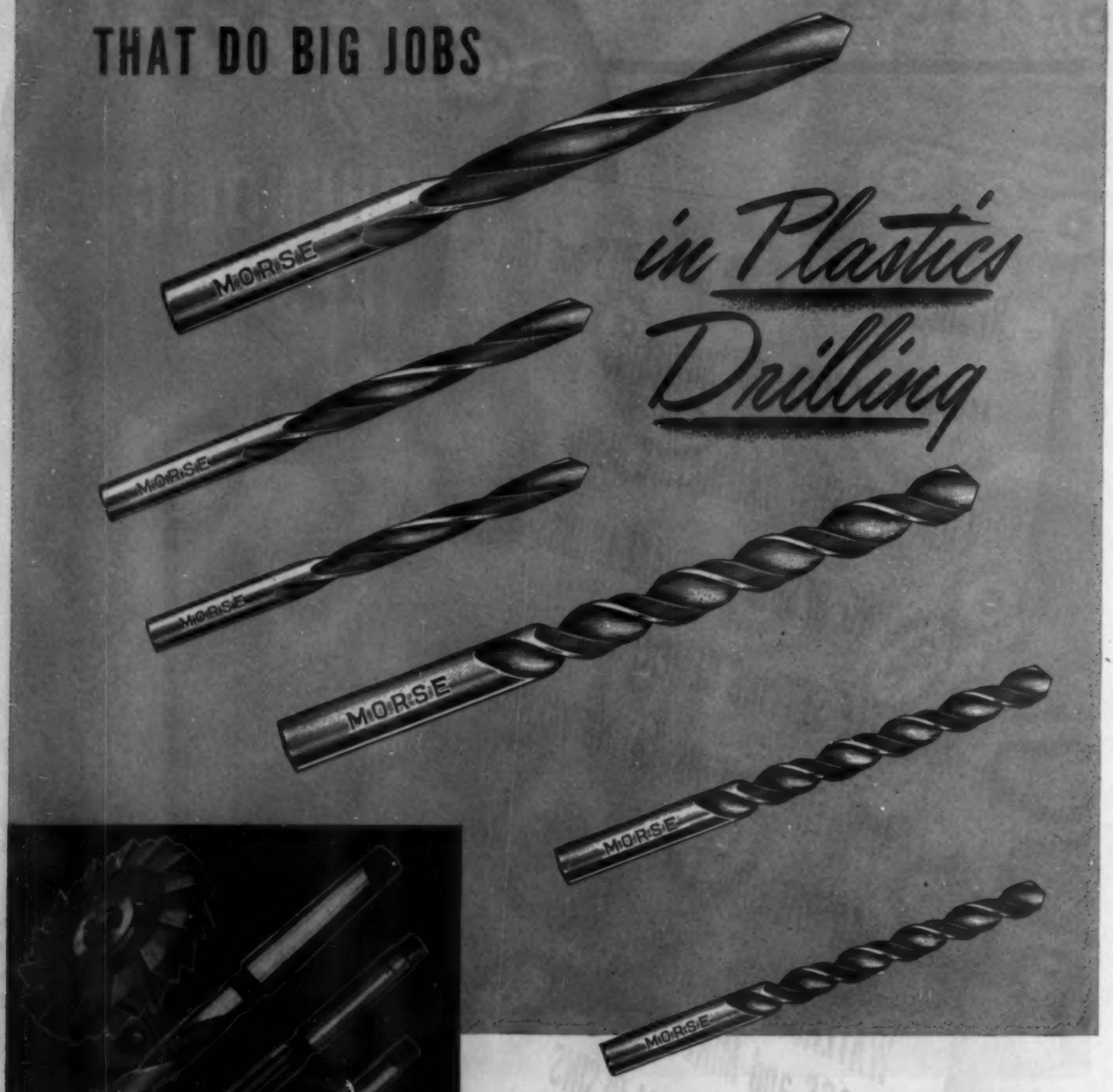

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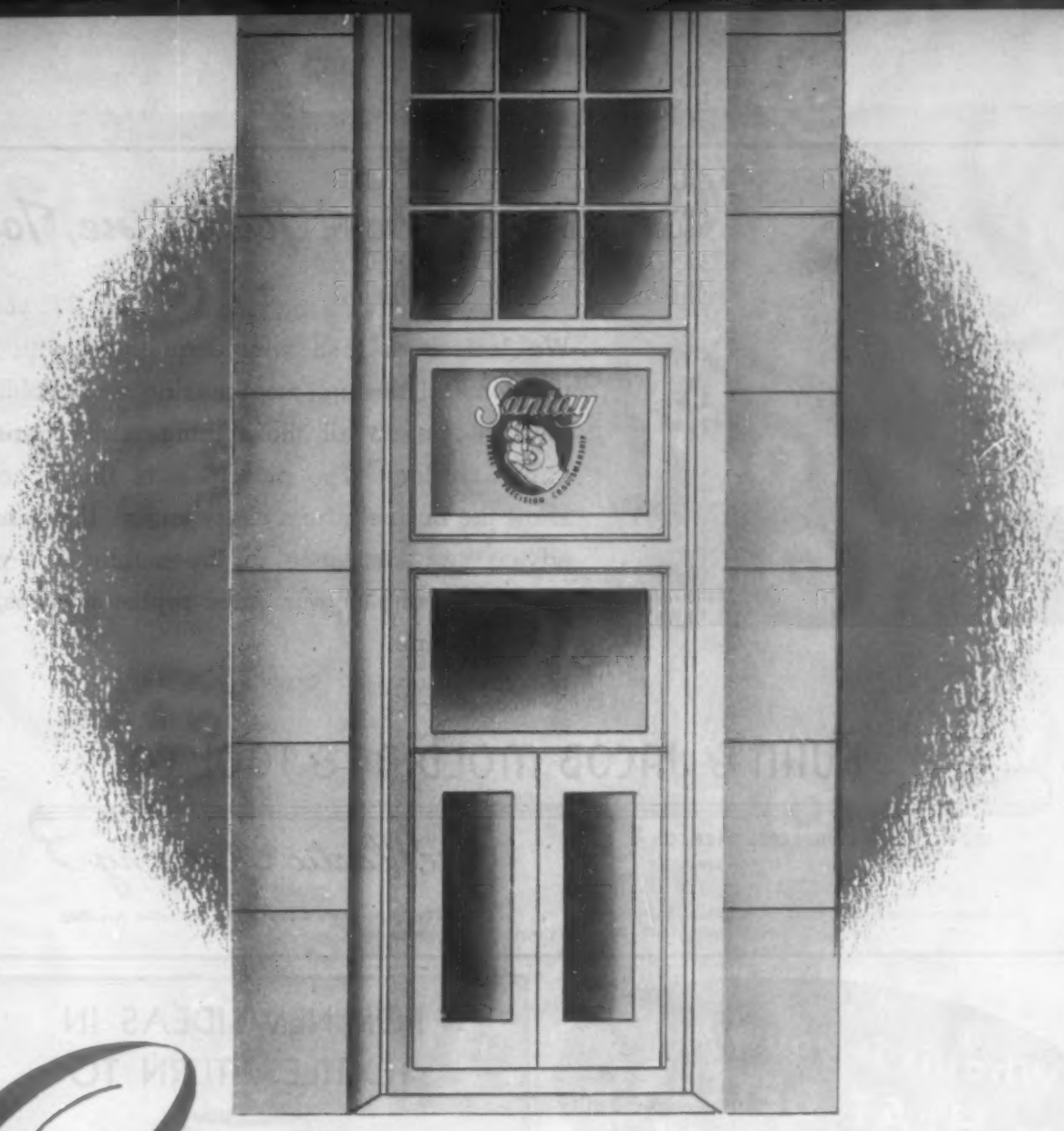

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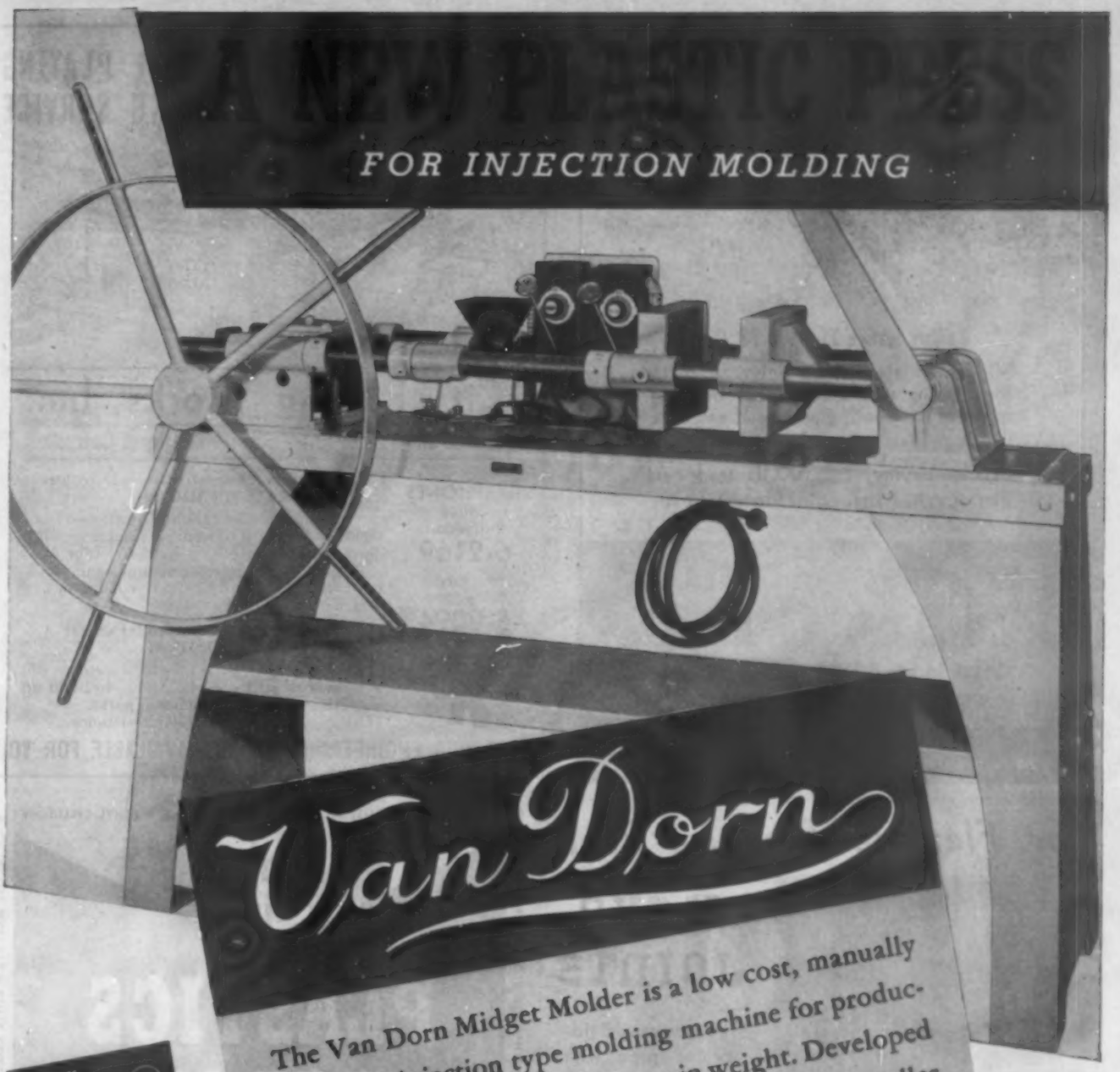

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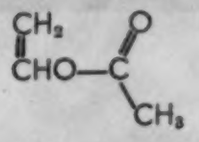

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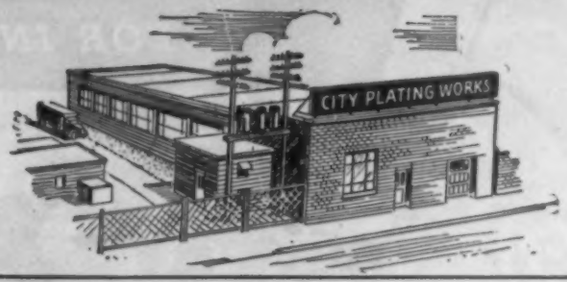

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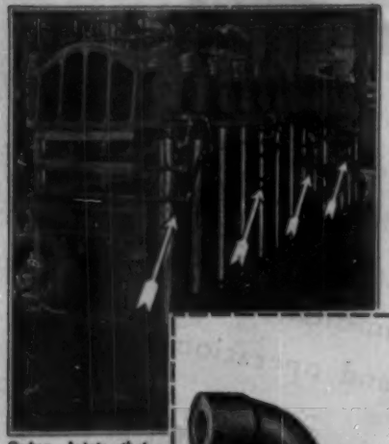

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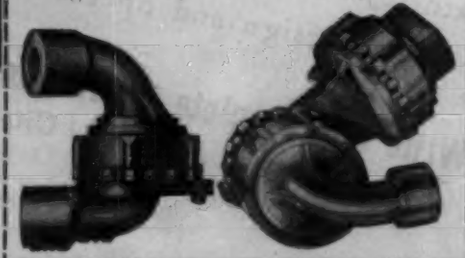

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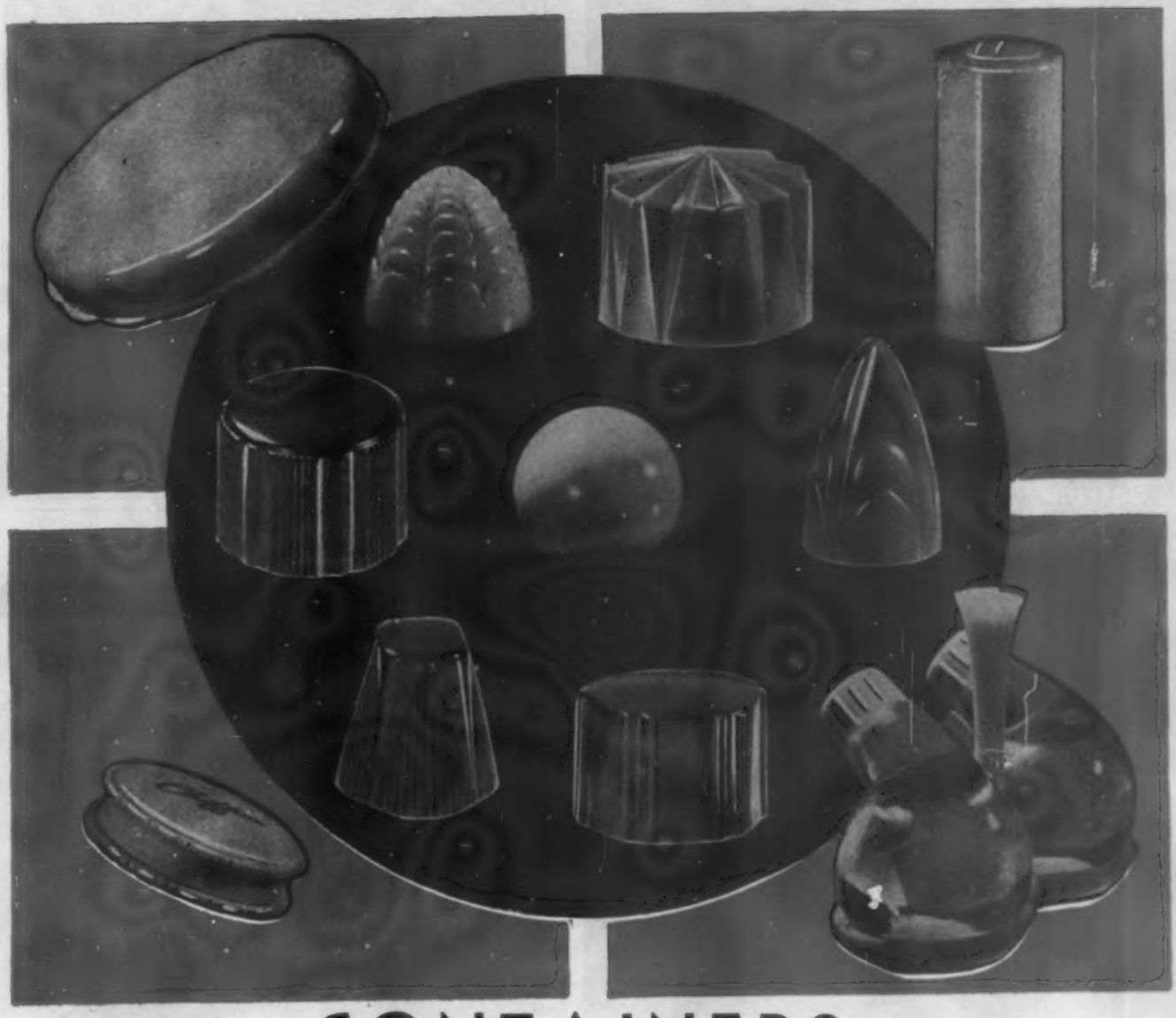

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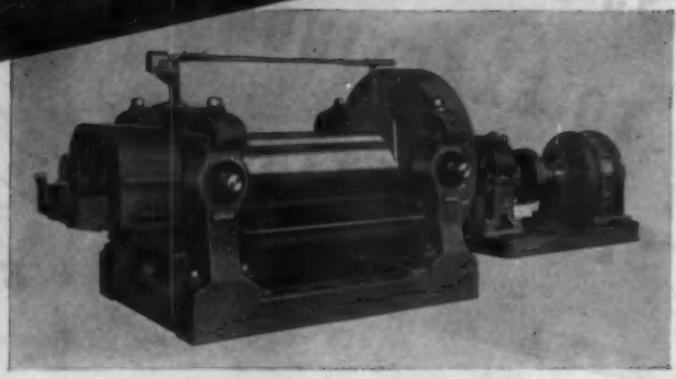

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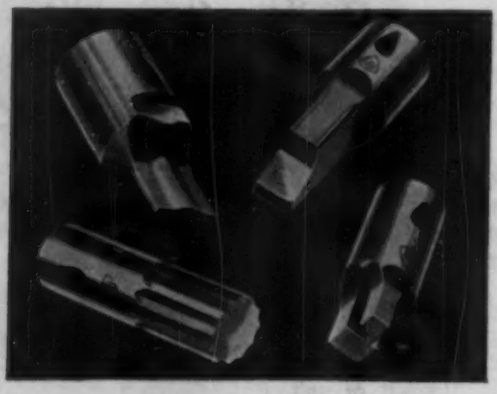

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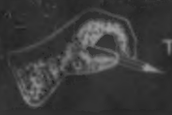

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ELECTRONIC CORPORATION

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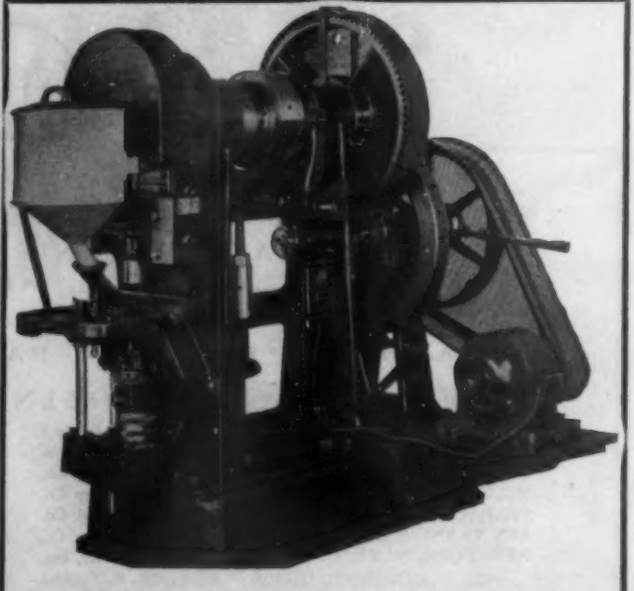

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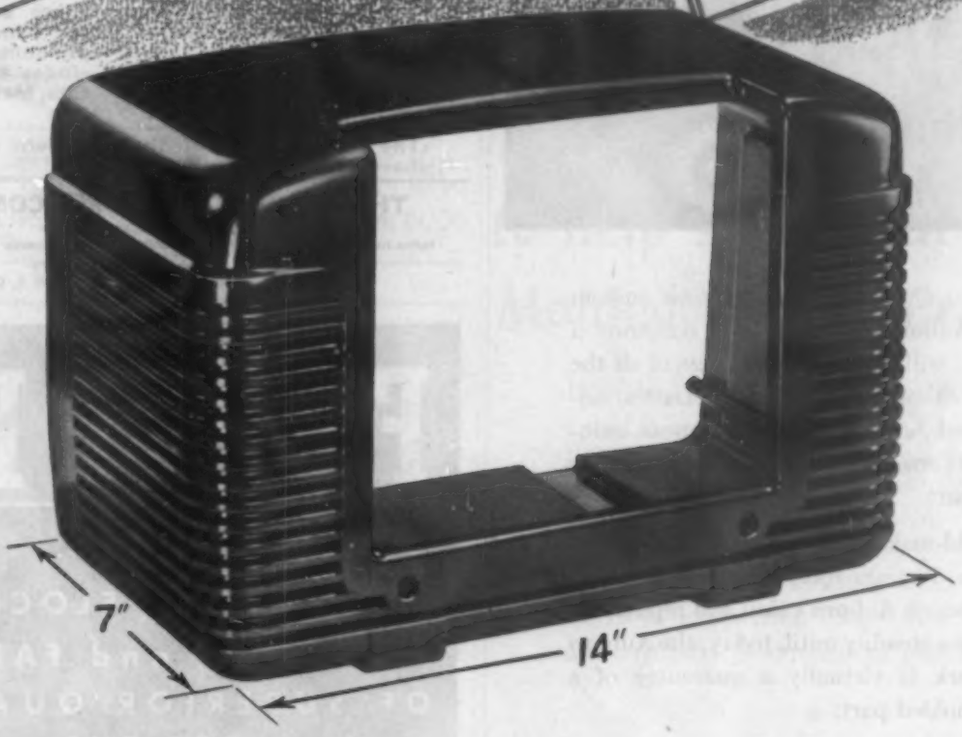
Painting operations performed on cabinets in our own plant.



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INTERNATIONAL MOLDED PLASTICS, INC.

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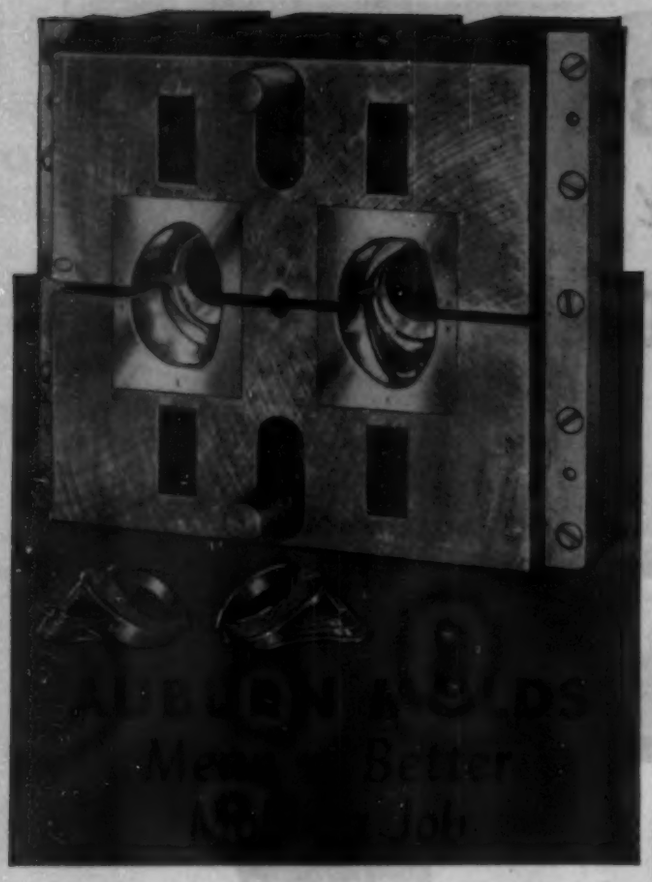

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INFRA-RED in the PLASTIC INDUSTRY

Branch of the Industry	Name of Appliance	Use
Molders (Thermoplastic) Injection	VIBRA-VEYOR (Variable heat)	To preheat plastic powder automatically. To dry plastic powder automatically
Molders (Thermosetting) Compression	PELLET-VEYOR (Variable heat)	To preheat pellets and preforms at the press as needed
Injection	HOPPER-HEATER (Variable heat)	To warm up heavy metal of hopper of molding machine
Molders (Thermoplastic) Extrusion	STRIP-HEATER (Variable heat)	To preheat strip rolls of vinylite, etc., automatically as fed to worm
Material Manufacturers	Special production equipment including vibrators, conveyors, stainless steel belts and electronic devices	To process various kinds of plastic material in bulk
Fabricators (Miscellaneous)	BENCH-KIT In various sizes (Variable heat)	To soften sheets, rods, tubes and any shape for bending, forming, punching, etc. This includes Cellulose, Acetate, Methyl Methacrylate

(The time on most of the operations mentioned above averages five minutes)

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Molecular Weight, 3200

Total carbon compounds	84.42%	Hydrogen	8.53%
Total fixed carbon	24.74	Oxygen	1.86
Ash (48% Vanadium Pentoxide)	0.57	Nitrogen	1.12
Sulphurous compounds	3.50	Water	4.00

Dielectric properties: Resistivity at
1.5 lb. sq. inch pressure 1.5×10^{14} ohm-cm.
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HOW DOES OUR PRODUCT COMPETE WITH OUR COMPETITOR'S?
HOW MUCH WILL IT SHRINK?
ARE WE USING THE RIGHT PLASTICS FOR THE RIGHT JOB?
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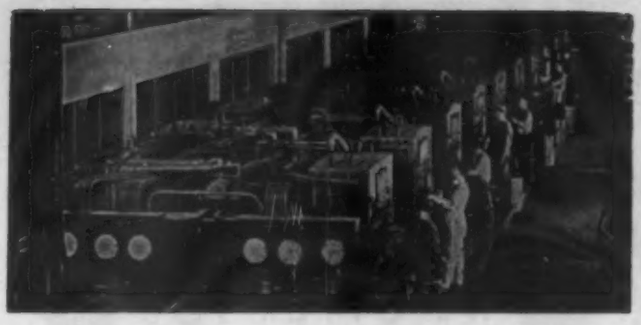

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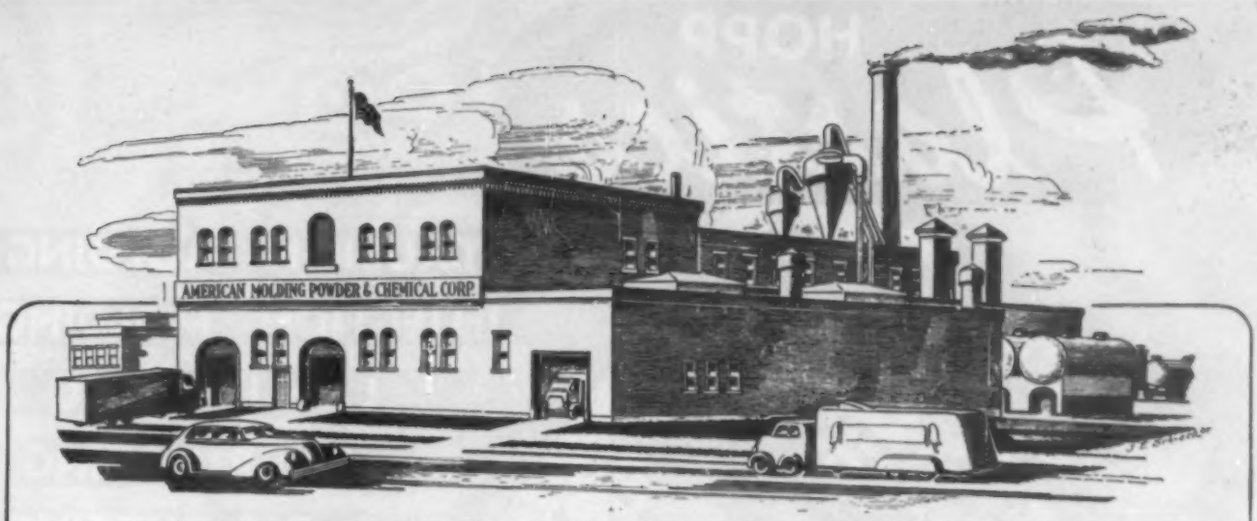

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plastics

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ESTABLISHED 1922

IDEAL ROTARY CUTTER
in
NEW PLASTIC CORPORATION PLANT

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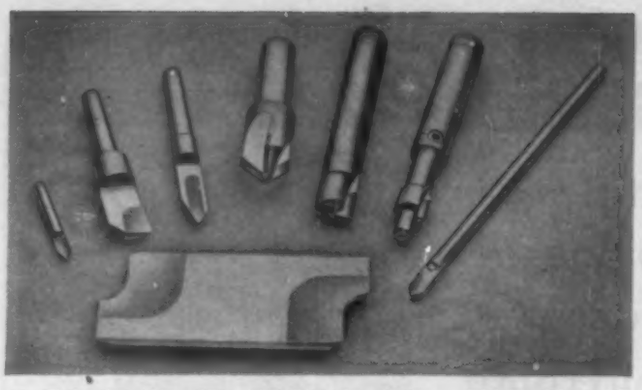

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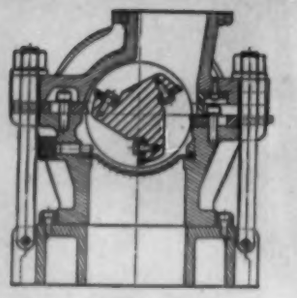

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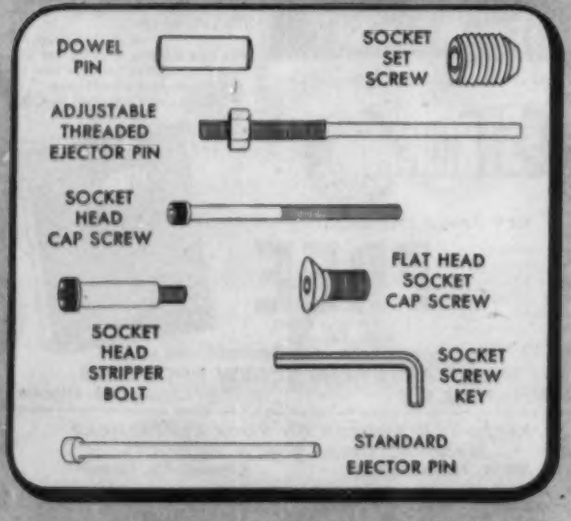

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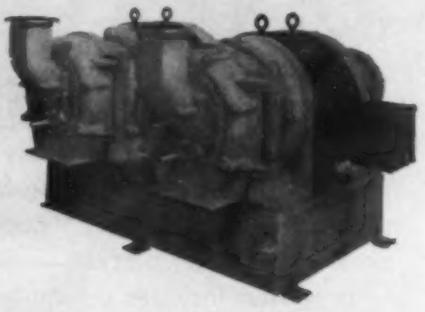

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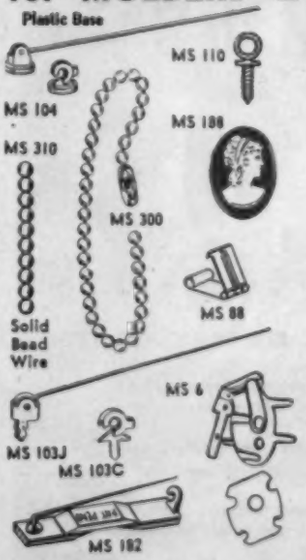
for MOLDERS & FABRICATORS of



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This piece has molded, threaded holes on three sides as well as being almost completely hollow on a fourth. It is so complicated a production job, that it might be considered almost impossible for molding. Yet, it is produced, complete with ten inserts, in a single operation.

One of the threaded holes has another threaded hole eccentrically placed within it. The entire piece is a housing for a mercury level.

This molding job saved thousands of hours of fabrication and, of course, a great deal of money. It is typical of the fine engineering in plastics performed by Insulation Mfg. Co.

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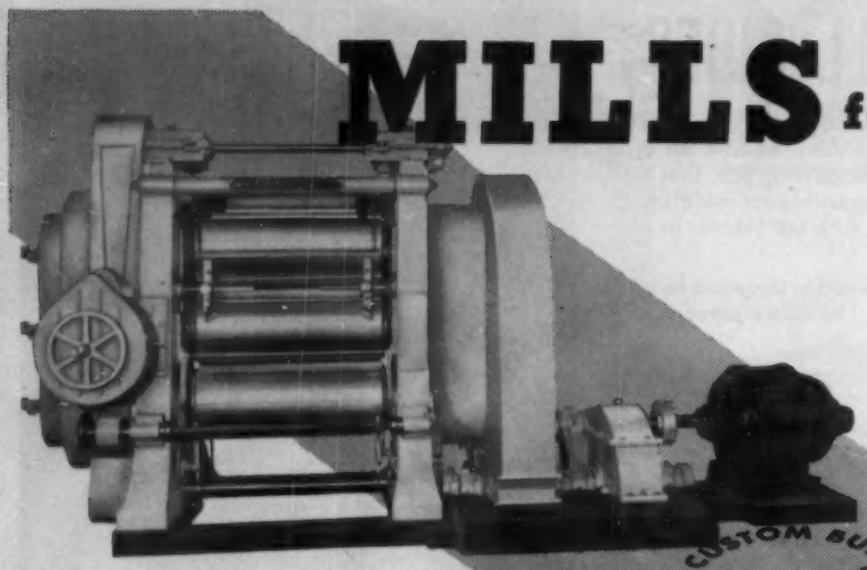
famco (COST CUTTING) **machines**

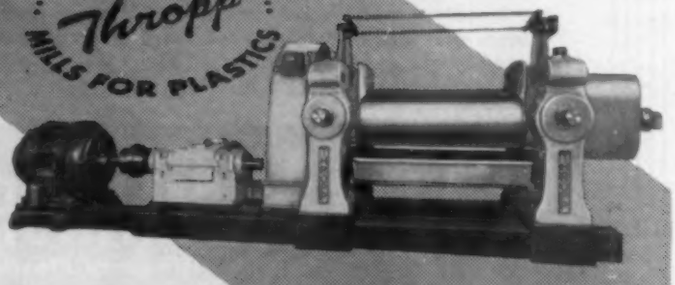
SQUARING SHEARS • ARBOR PRESSES • FOOT PRESSES

MILLS for Plastics



These new, heavy duty, three roll Calenders and 22" & 22" x 60" High Speed Mills, are just two of the many new Thropp precision built machines especially designed for plastics. They are available in all sizes for production and laboratory use. All machines are custom built and designed to meet customers' special requirements.

...CUSTOM BUILT... Thropp MILLS FOR PLASTICS



ANTI-FRICTION BEARINGS

For plastic manufacturers whose mill and calender requirements include high temperature and a precision product, we have developed a complete line of mills and calenders incorporating Anti-Friction Bearings.

These bearings are designed to provide the finest precision service available, as well as provide a bearing with circulating lubrication that does not leak.

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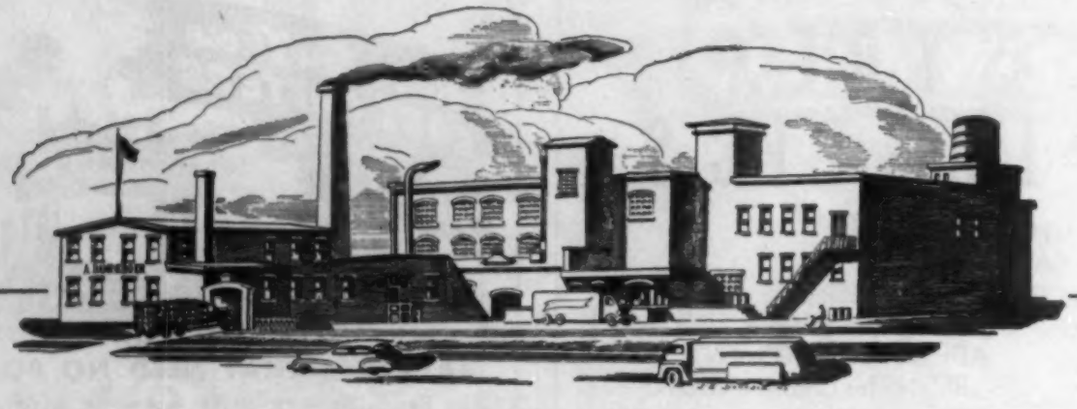

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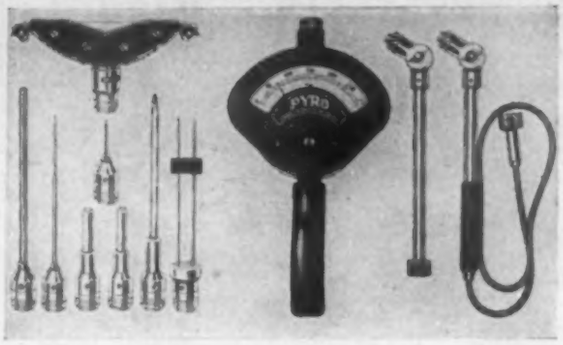

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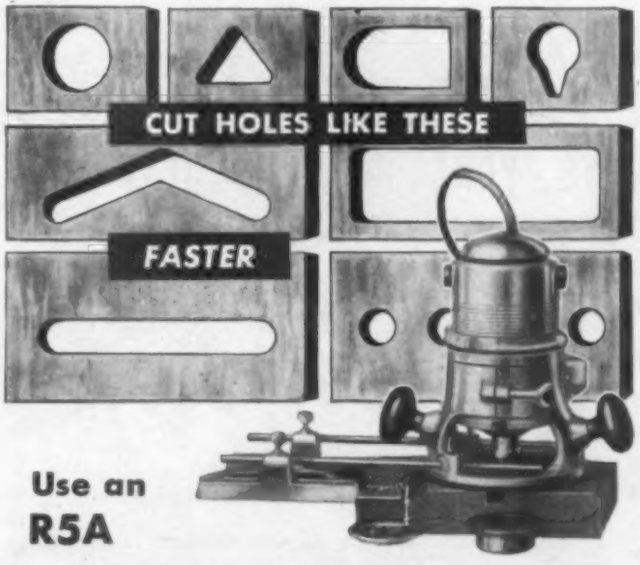

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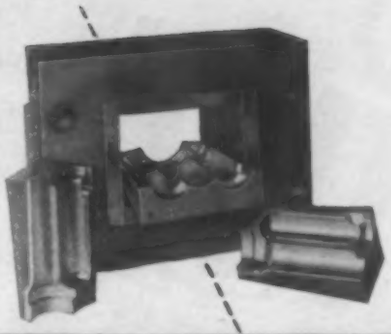
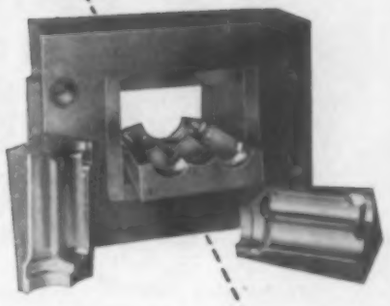


WHICH MOLD STEEL WOULD YOU HIRE FOR THE JOB?



Suppose two men asked you for a job. Before putting either one to work, you would check his physical fitness as well as his ability, integrity and dependability.

And the same holds true when you "hire" a mold steel for your job. The molds shown here are identical in appearance. But, you will want to check each one's "under-the-surface" qualifications.

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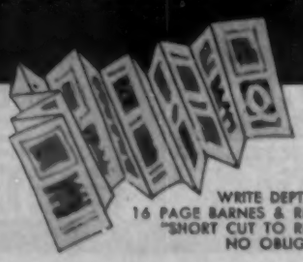

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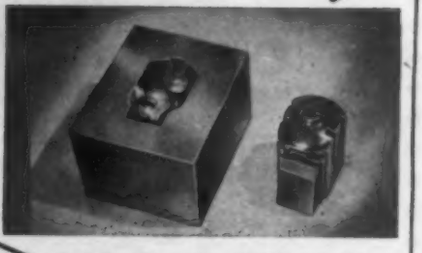

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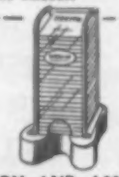

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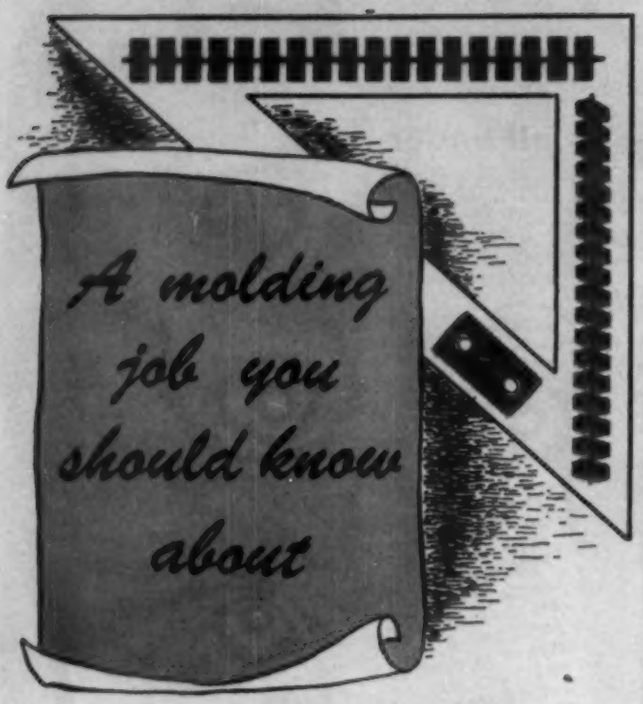

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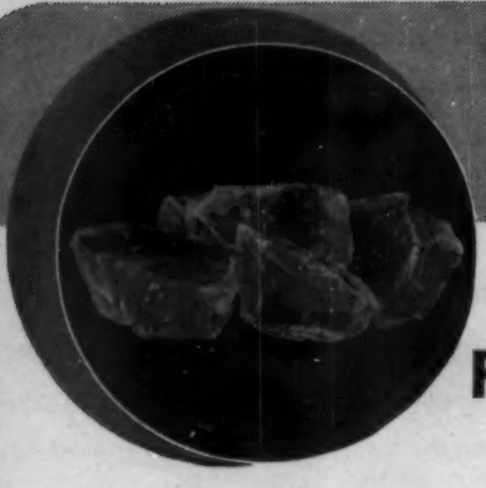

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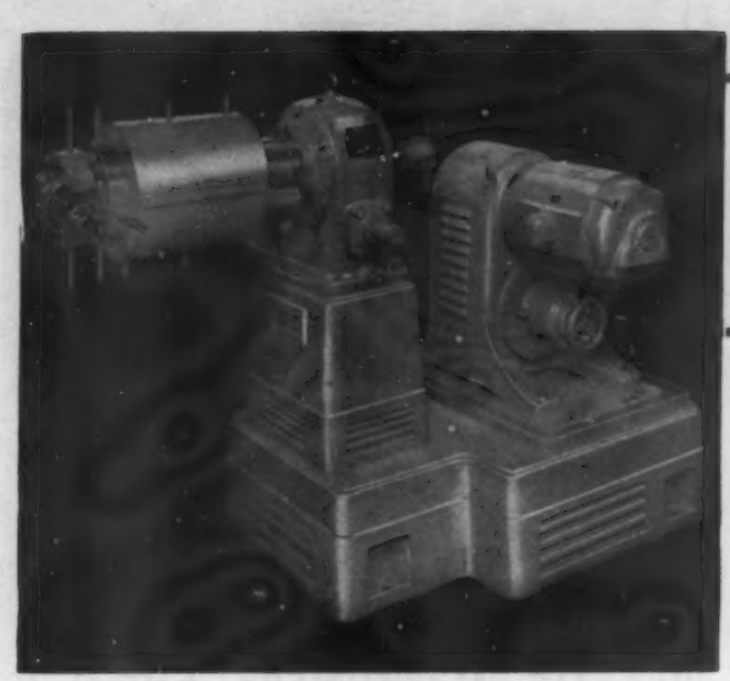

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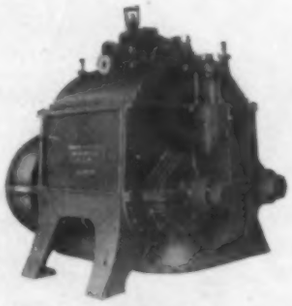

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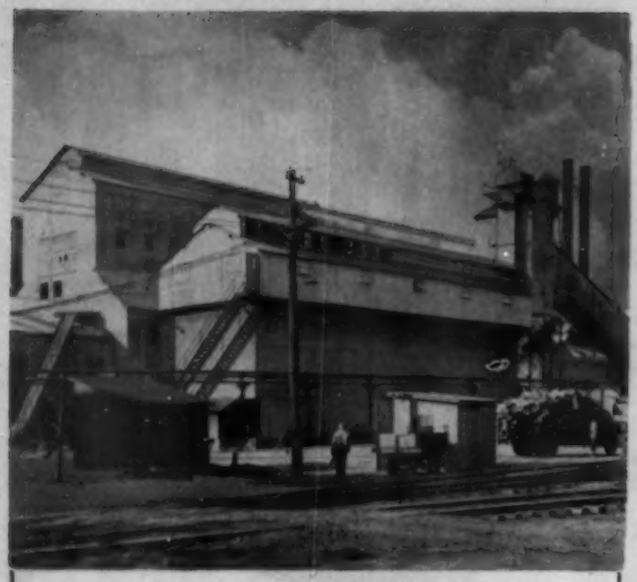

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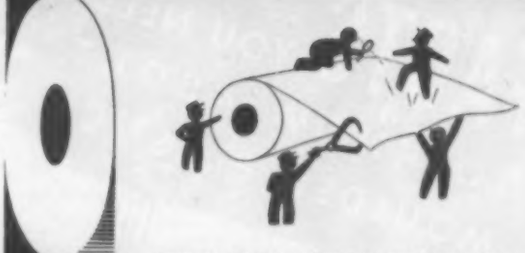

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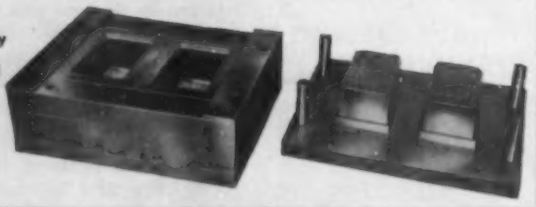

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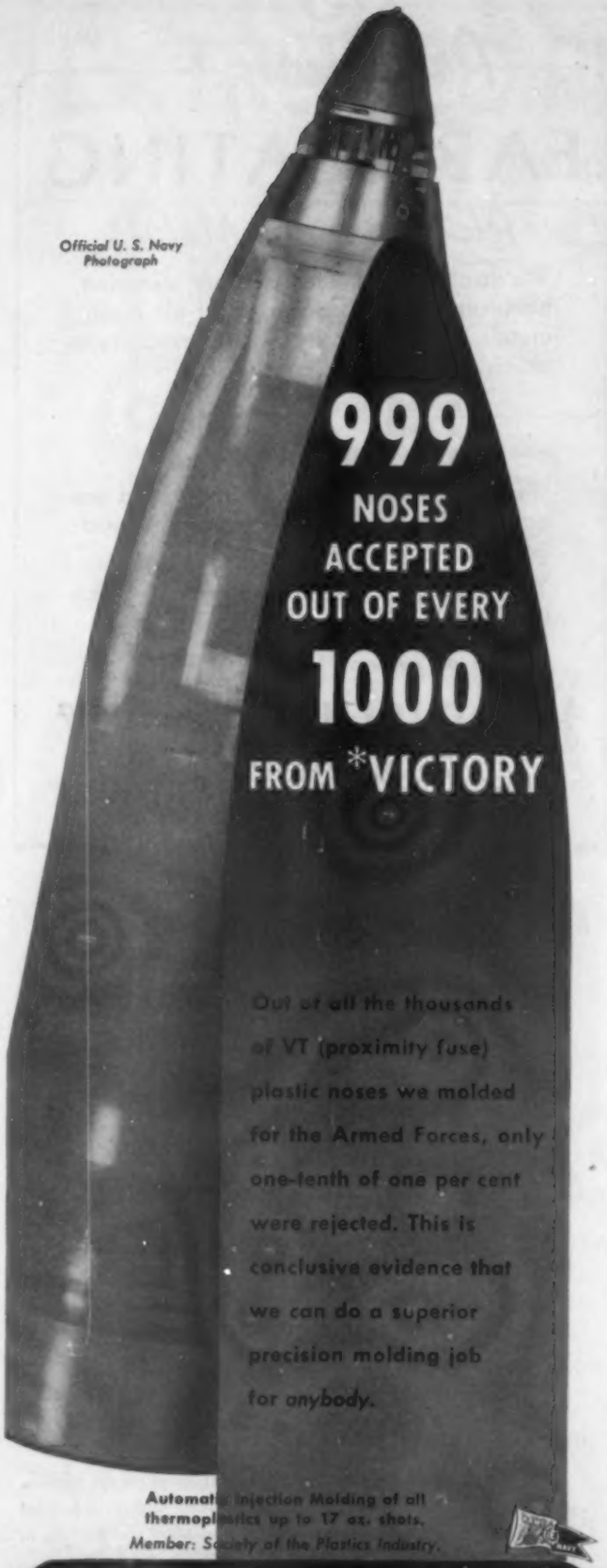
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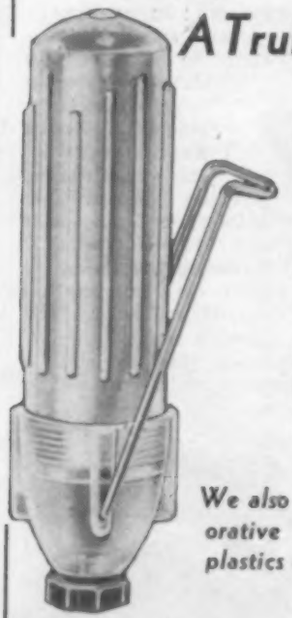

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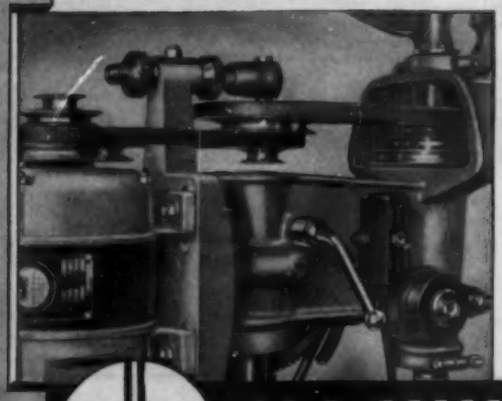

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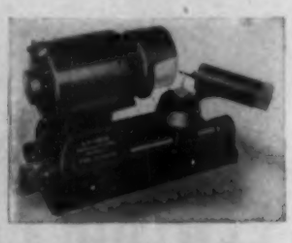

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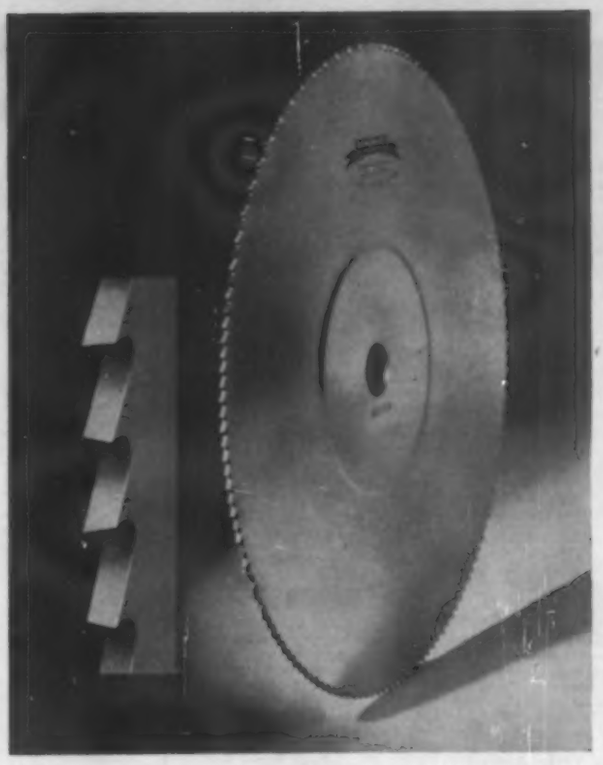

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WANTED: Veteran desires apprenticeship with plastic concern. Know little about mfg. of plastics but willing to learn. Prefer N. Y. area. Reply Box 1512, Modern Plastics.

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VETERAN desires apprenticeship with plastic concern in N. Y. area. Wages secondary to future. No experience in plastics. Willing. Reply Box 1517, Modern Plastics.

MANUFACTURERS REPRESENTATIVE seeking item in plastics. Has contacts with Jobbers, Distributors, Exporters, chain and department stores. Riverdale Distributing Co., 220 West 42nd Street, New York City.

We have an opening for a capable, agressive young man in our sales department. This man should have a technical education as well as some experience in the plastics field. Other requisites are ability to work hard and a pleasant personality. In reply include non-returnable snapshot, complete educational and experience details and salary requirements. Location: East. Reply Box 1518, Modern Plastics.

PRODUCTION MANAGER AVAILABLE. 23 years experience in mass production on army rubber raincoats, synthetic resins, plastic coats, etc. Have proven organizational ability. Graduate of P.I.T.I., N.Y. Interested in heat sealing on vinyls. Will consider location out of town or abroad. Excellent references. Married. Reply Box 1519, Modern Plastics.

POSITION WANTED: Plastics production, development. B.Ch.E. '40. Age 26. Experienced chemical production, control, testing. Knowledge machine shop practice. Diesel maintenance. Reply Box 1521, Modern Plastics.

Company with annual volume over $100,000,000 in affiliated field is interested in purchase of established plant producing unsupported film. Replies confidentially handled. Reply Box 1526, Modern Plastics.

FOR SALE: (1) Quincy Air Compressor size 5 x 4, water cooled, 15 H. P. motor, 220 volts, 60 cycles, 3 phase. V belt drive with vertical air tank, 72" long, 20" diameter with start compensator. $475.00. Sal-Press Company, 388 Warren St., Brooklyn, N. Y.

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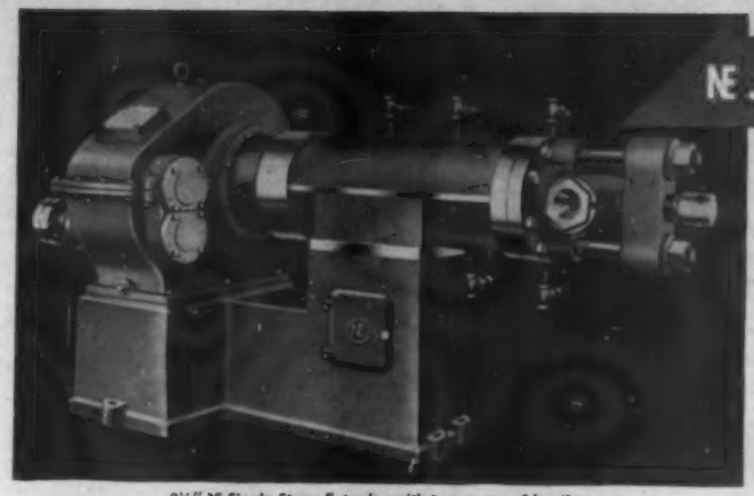

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are widely used where materials are readily plasticized. Illustrated is a 3½" Resin Extruder with special cylinder construction and two zones of controlled heating.

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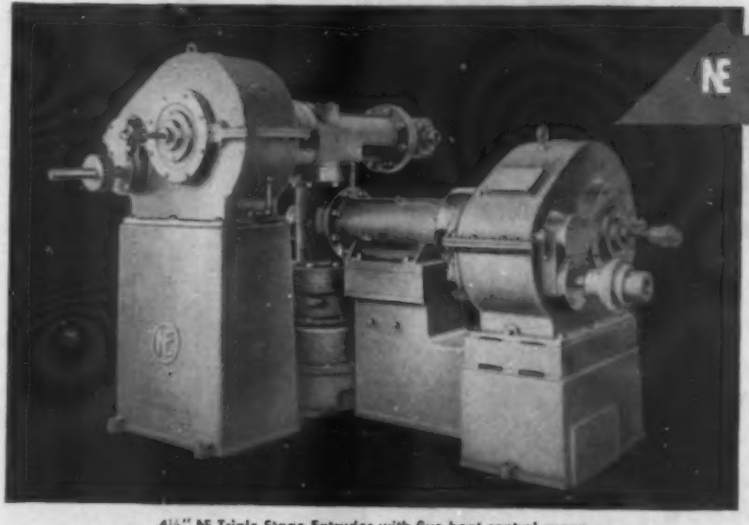

4½" NE Triple Stage Extruder with five heat control zones

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Technical man experienced in transparentizing paper. Ability to work with research chemists and design or assist in the design of equipment for transparentizing papers. Experience more important than age. Give complete information in first letter, including salary requirements. All answers held confidential. Reply Box 1400, Modern Plastics.

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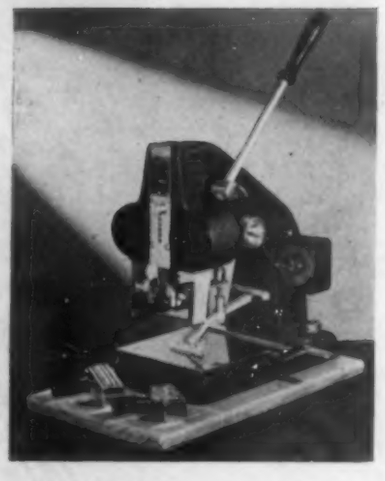

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In the manufacture of plastic products, there is no factor of greater importance than the selection of mold and hob steels. The choice of the right steels not only helps to eliminate production difficulties and to assure a perfect product, it also helps to keep manufacturing costs at their proper level. Whether your manufacturing method calls for injection or compressive molding, select your steels with care.
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For most applications, mold steels should be of low carbon content —soft enough to permit easy hobbing and machining, yet capable of developing sufficient hardness to keep from distortion and resist excessive wear. In order to produce smooth, clean cavities, the steel should be fine-grained—free from porosity and surface irregularities and properly annealed.
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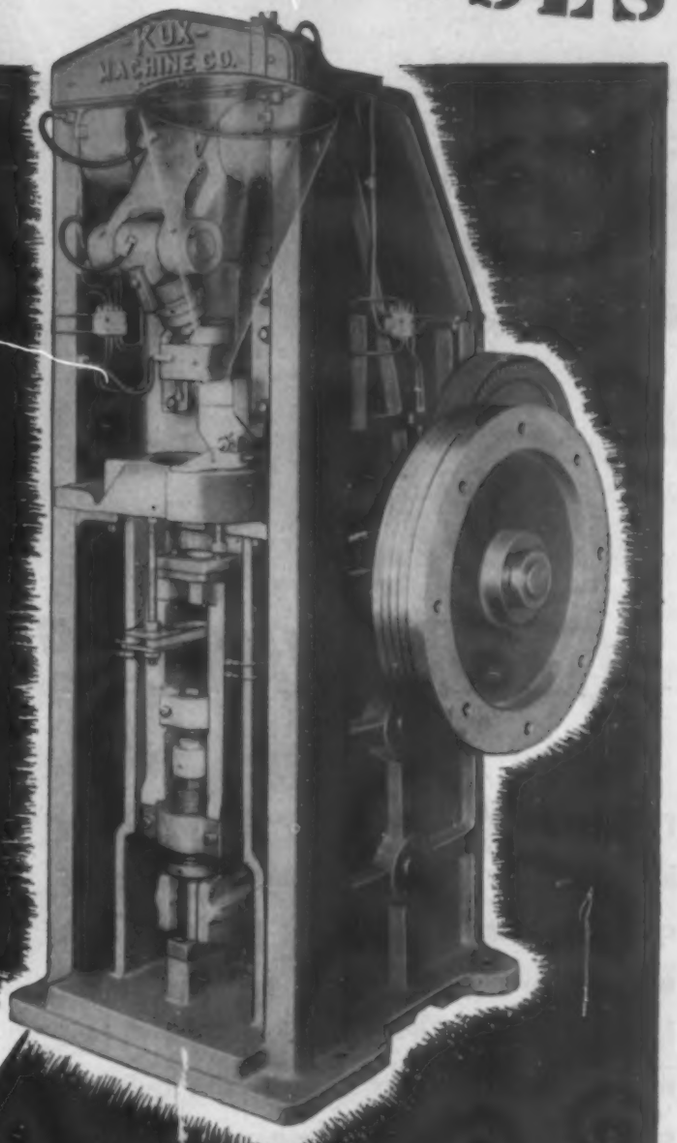

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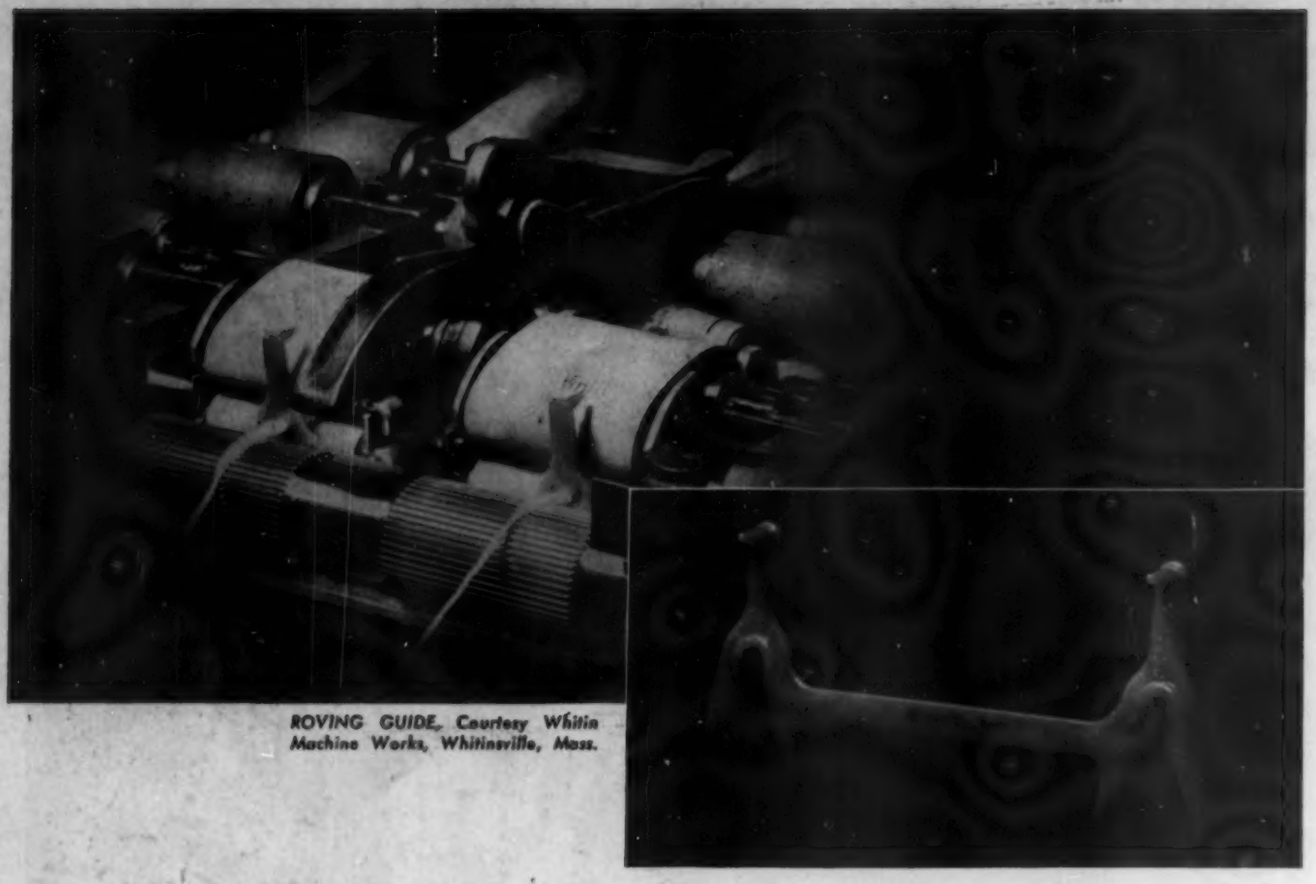

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